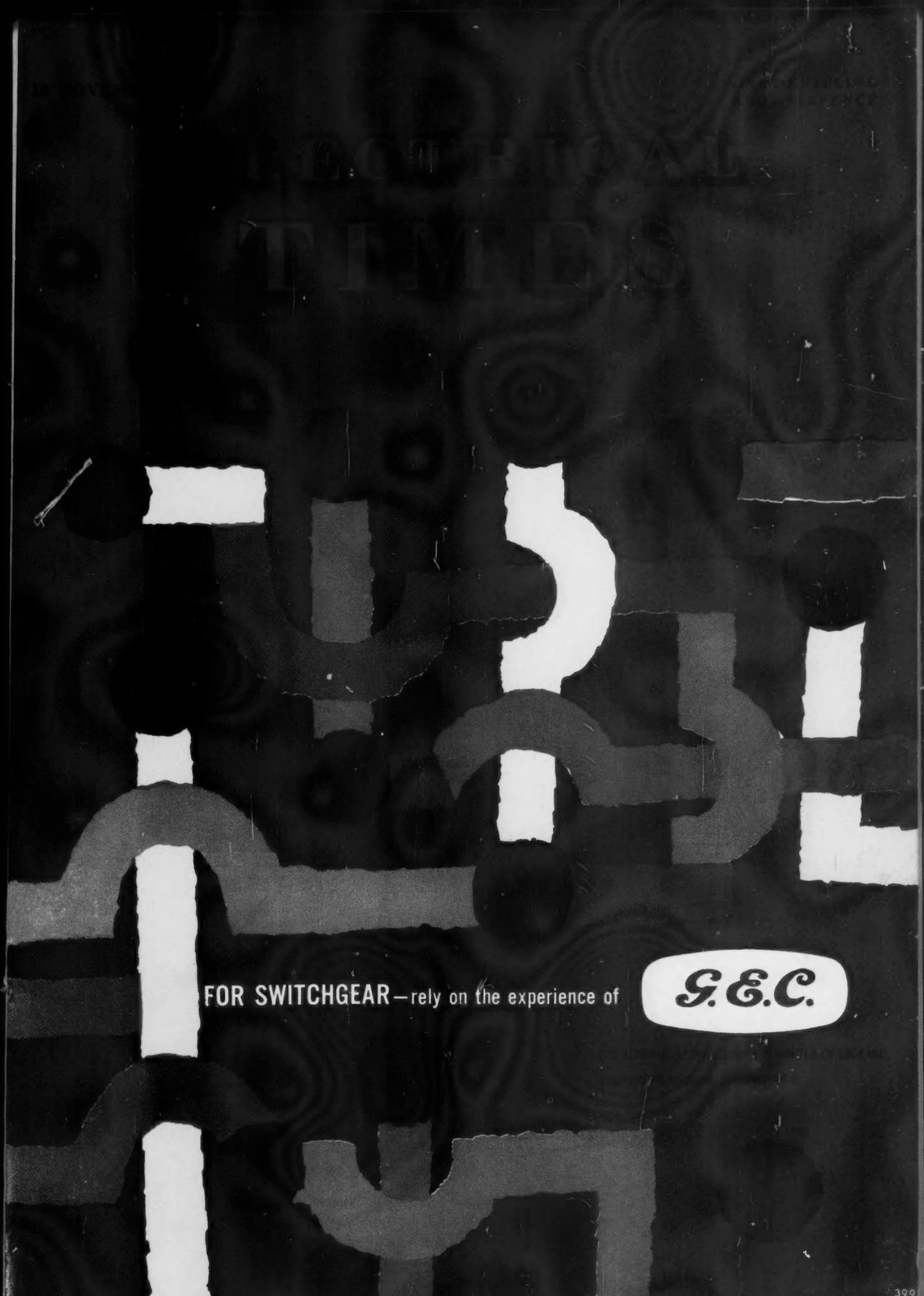
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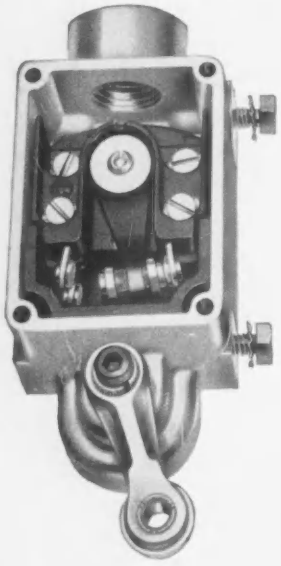
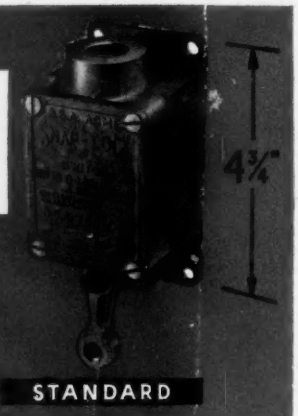


Two only replaceable assemblies in the electrical side: moulded one-piece contact block and arm. Interchangeable on all Mark II versions.

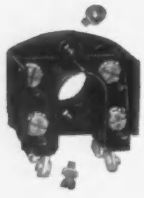
Water Oil and Dustproof or Flameproof versions



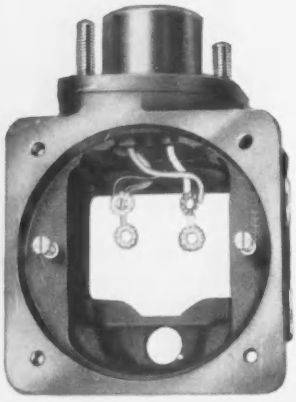
STANDARD

WATER, OIL & DUSTPROOF

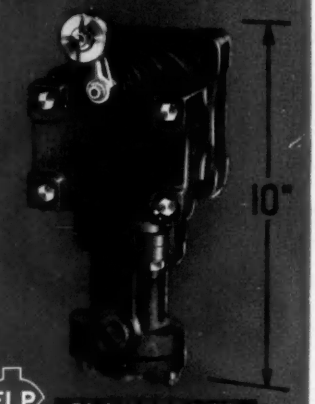
Single pole, double break, double throw, operates with either circuit normally open with other closed, or maintaining in either position, or available with central (neutral) position and/or centre connection. Heavy aluminium die-cast case. Conduit ¾" B.S., or No. 3 Admiralty Pattern Cable gland entry. Two-screw side mounting or backplate mounting in two styles, or Tandem style (back to back mounting). Operating lever position adjustable in 7.5 deg. increments through 82.5 deg. either way from normal.



Standard Neutral position or Centre connection



The mechanism of the Flameproof switch is easily removable as a unit for servicing.



FLP FLAMEPROOF

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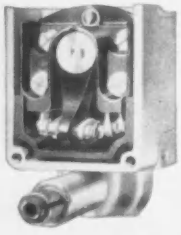
MARK II



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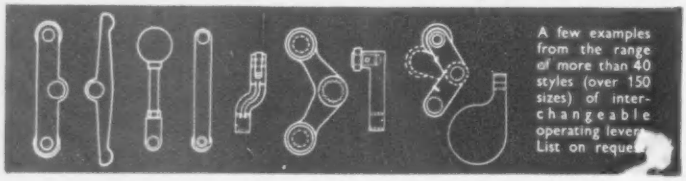

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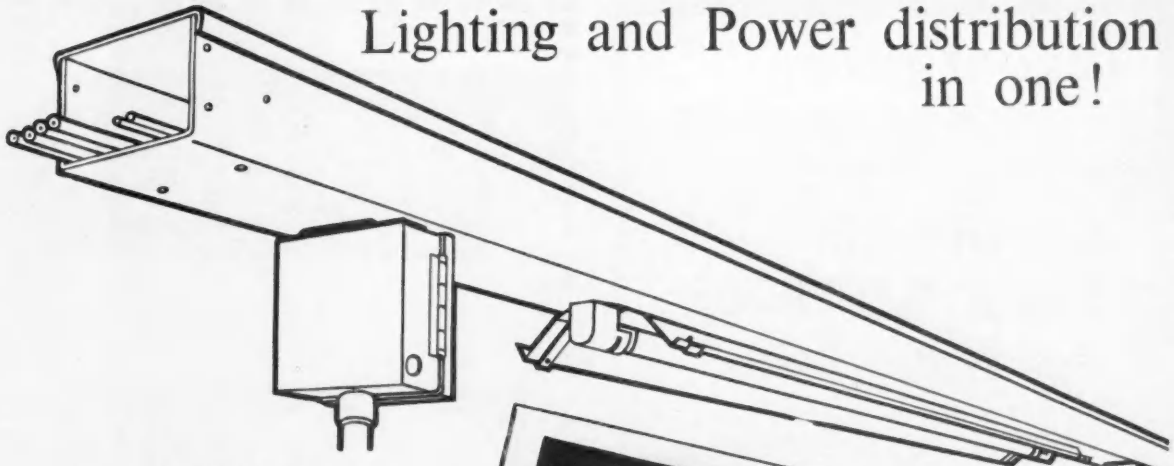

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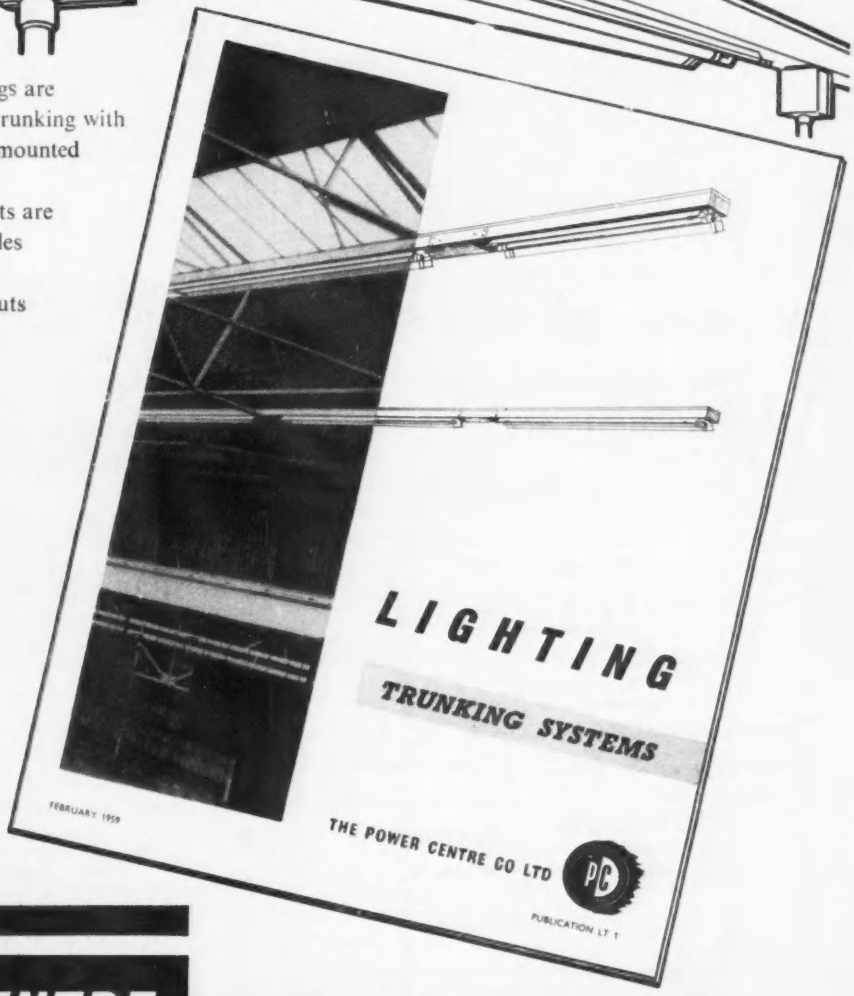

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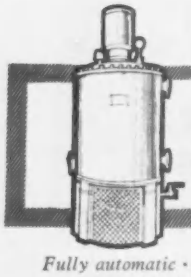

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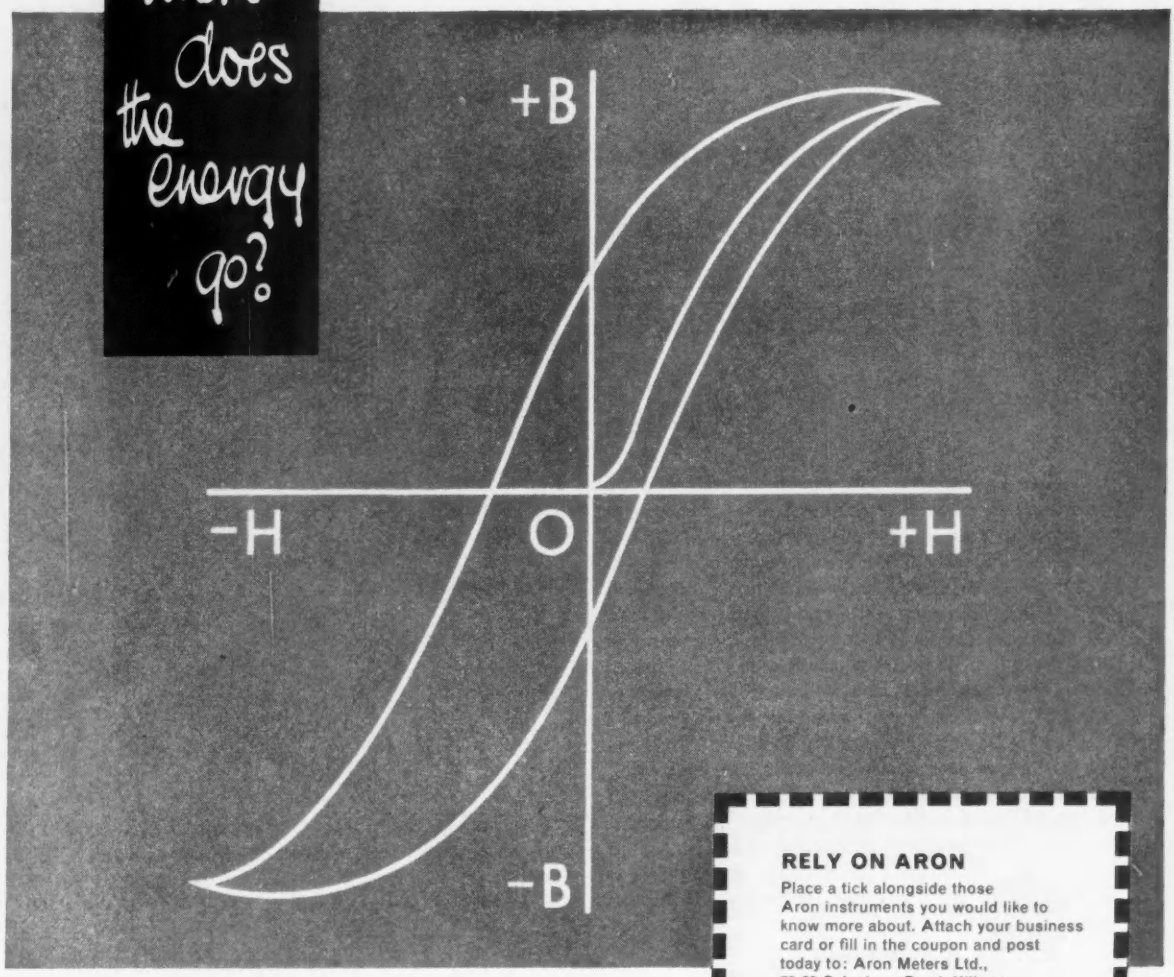

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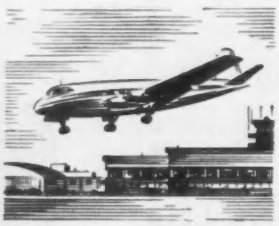

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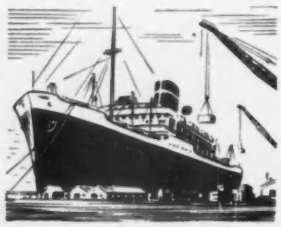

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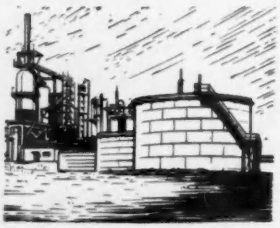

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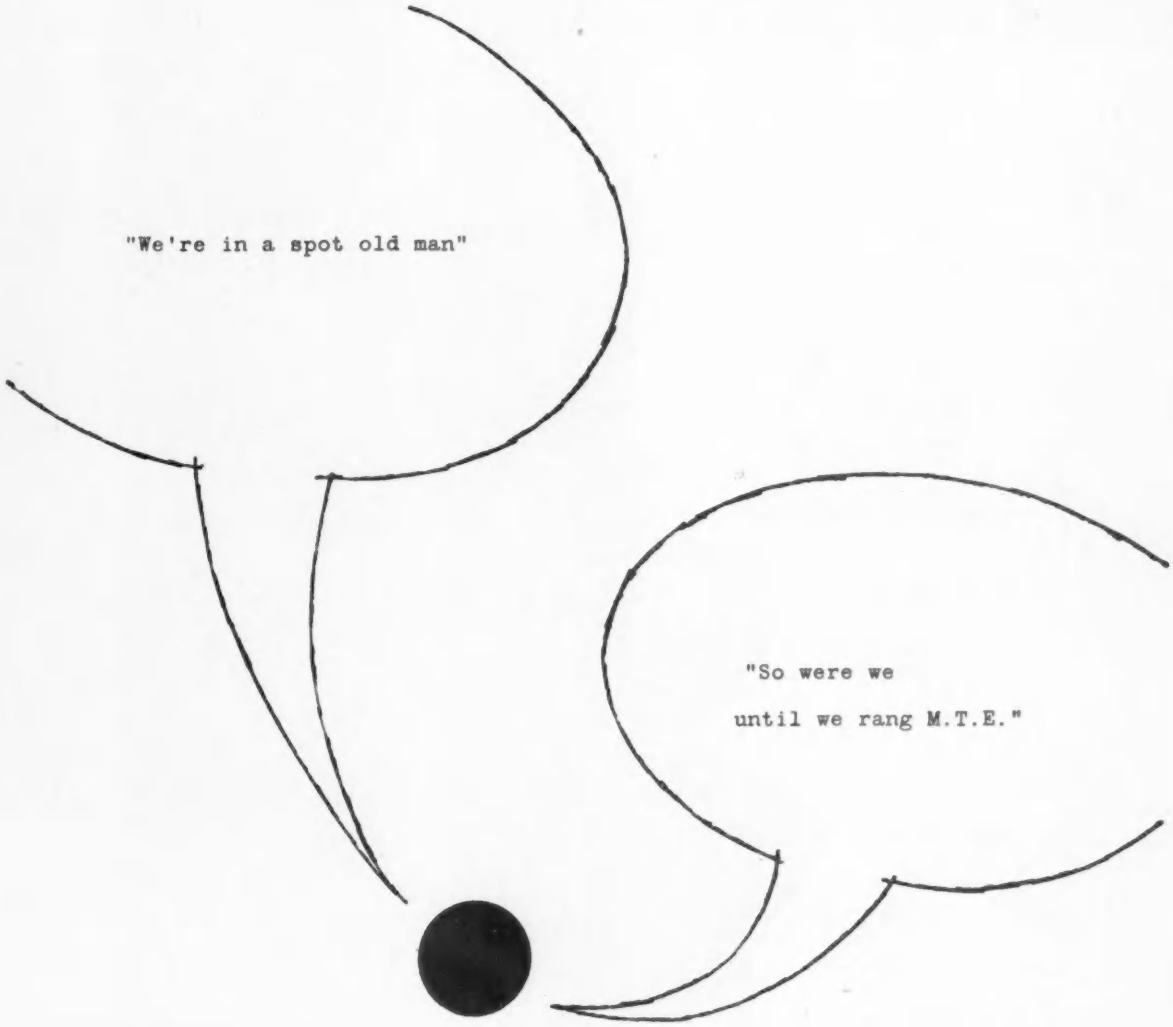

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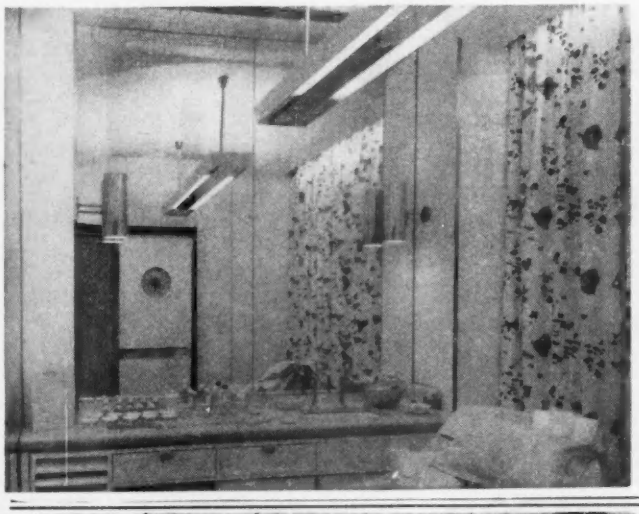

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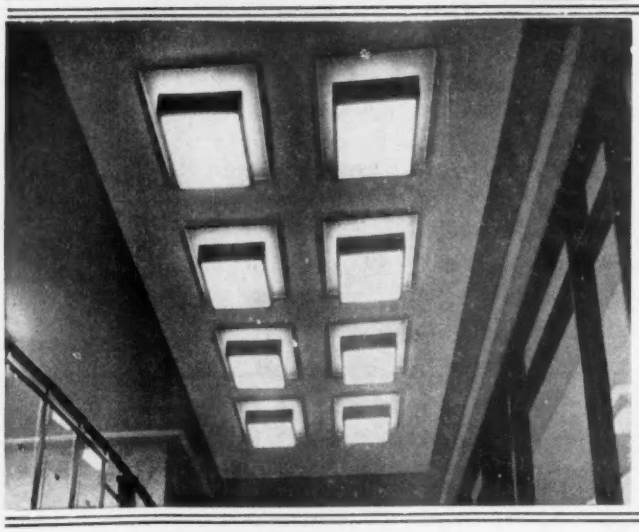

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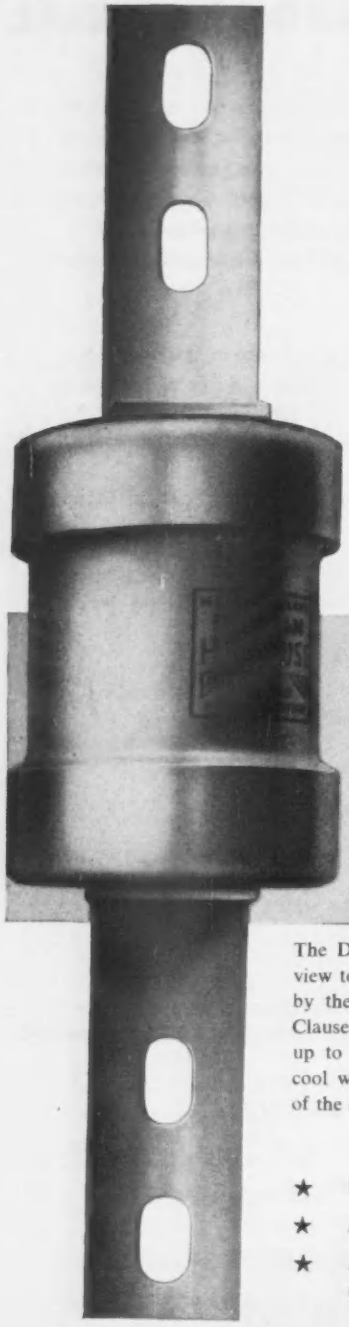
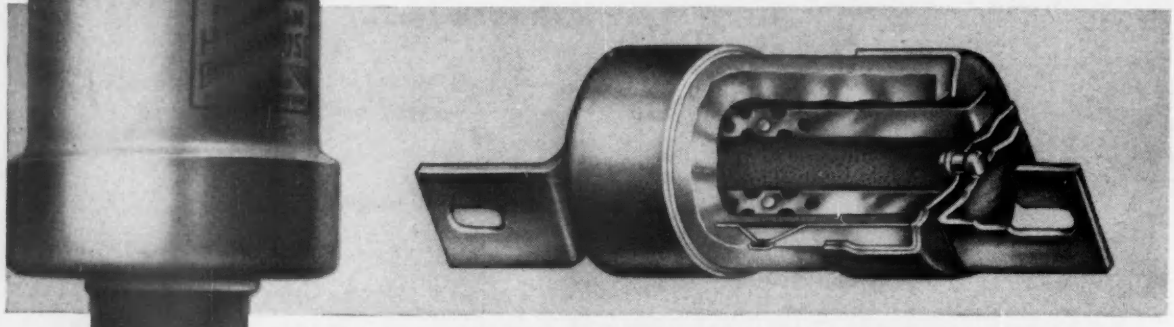


DORMAN

TYPE 'Q' H.R.C.
cartridge fuse links up to 800 amp. rating



The Dorman type 'Q' H.R.C. Cartridge Fuse Link has been designed and developed with a view to achieving a fusing efficiency hitherto unknown. It has been subjected to stringent tests by the Association of Short-Circuit Testing Authorities, in accordance with B.S. 88, 1952, Clause 8 and having passed such tests successfully has received A.S.T.A. Certificates for ratings up to 800 amp. for category of duty 440v. In actual performance the fuse link remains cool when carrying its full load and, due to the special construction of the element, is consistent in operation.

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ET/10/11/60

NEWS SHEET

Glasgow suburban railway electrification scheme inaugurated by Sir Brian Robertson last week; cost £16m. Operates on 25 kV a.c. and is to be extended south of Clyde during 1961. (735)

Explosion at Bold "A" power station due to disintegration of l.p. rotor of No. 2 (30 MW) machine. Two other sets damaged by flying debris. (733)

Overseas graduate engineers' training in UK needs closer attention to special requirements, thinks FBI expert; more contact with professional engineers required, less work on production techniques. Government financial assistance might encourage smaller firms to co-operate. (708, 714)

Thermo-electric refrigerating unit now on market offers 1 W heat-abstraction capacity for cooling electronic components or measuring instruments. (728)

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Revised recommendations for practical training of graduate engineers issued by IEE. Stress on need to match pace and challenge of academic course. (737)

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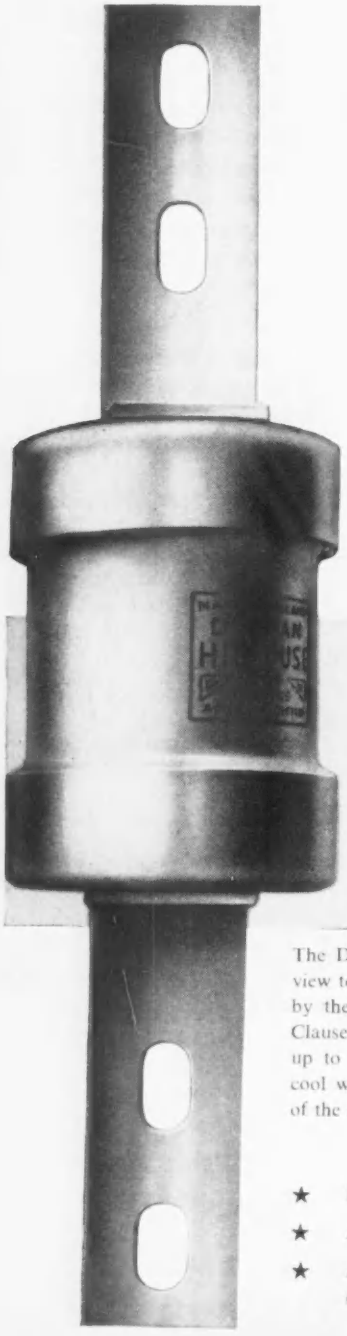
PEOPLE—F. R. Mason becomes sole managing director, AEI Export . . . Sir Hamish D. MacLaren and Sir Vincent Tewson appointed part-time members, LEB . . . H. R. Parkin promoted to chief engineer, English Electric meter, relay and instrument div. . . . J. J. Pache becomes station super., Clarence Dock . . . S. Western EB's chief accountant, C. E. Knight, also appointed group adviser, Bristol and Somerset . . . F. O. Brown promoted to station super., Hams Hall . . . N. J. Winnett returns to GEC Swinton works as manager . . . Dr A. T. Churchman becomes deputy director, CEGB Berkeley Nuclear Labs . . . Duncan W. Low retires as managing director, successor D. R. Lapthorn . . . In UKAEA changes, R. V. Moore and Dr H. Kronberger become deputy managing directors, dev. and engrg. group, with P. T. Fletcher deputy m.d. general management, and S. Fawcett director of reactor design. (724, 726)



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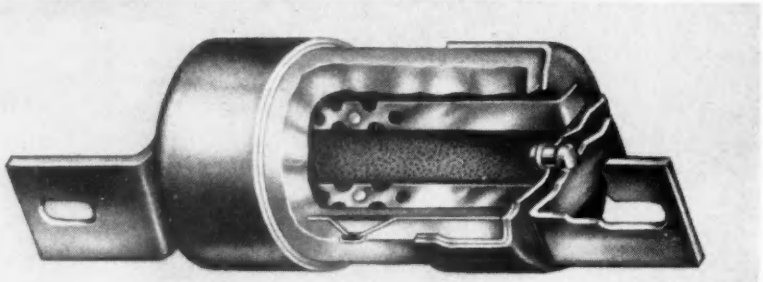

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NEWS SHEET

Switchgear standardisation brings savings for manufacturer and user, says D. E. Lambert, of Brush. Reduction of variety of requirements by users can save expense and time. Higher British safety requirements can make export difficult on price ground. (707, 709)

Yard, pound-mass, defined in international metric standards in new Weights and Measures Bill. Electrical units also referred to international definitions. Nine-man commission to advise BoT on measurements and units generally. (707)

Generating plant deliveries in Europe reach new peak in 1959 according to OEEC survey. Turbo and hydro-electric generators up by 20%, but transformers down 10% on 1958. Indications for 1960 suggest further fall in demand for water turbines. (728)

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'SUPERFORM' SWITCHBOARDS

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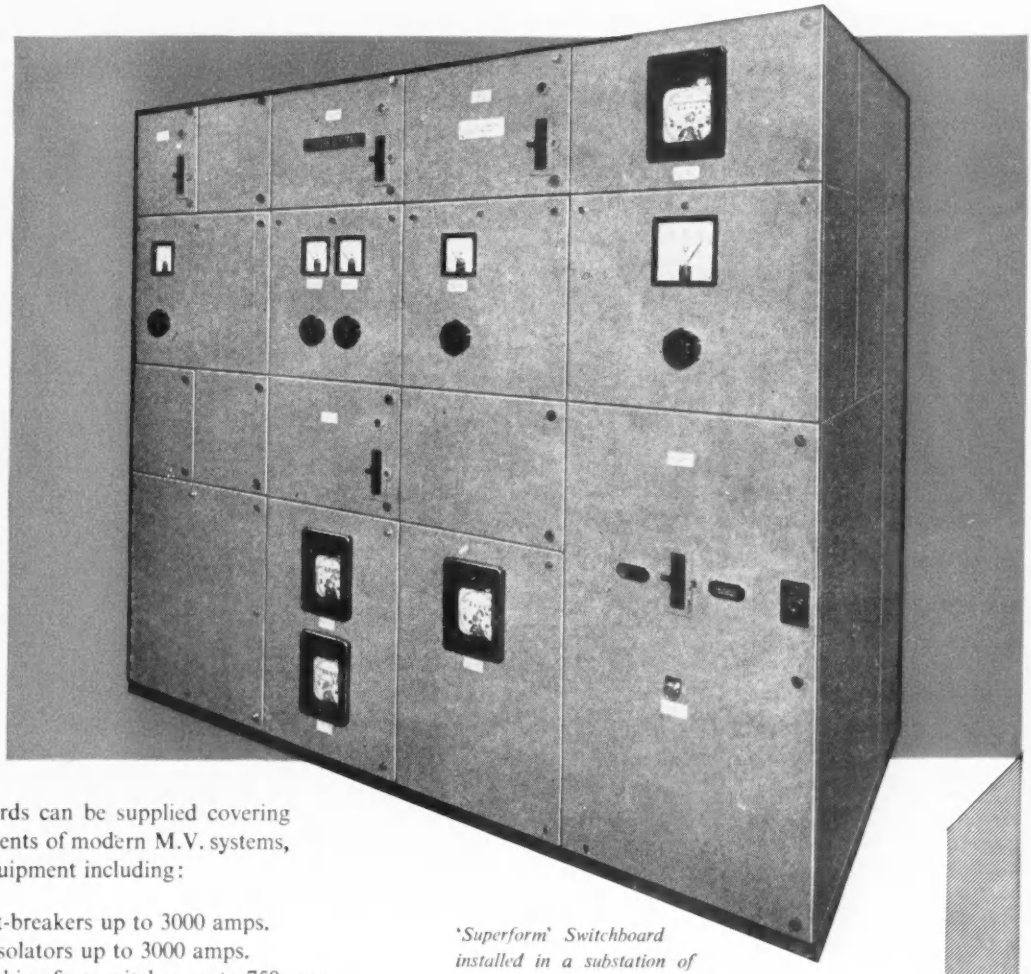

'Superform' Switchboard installed in a substation of R. B. Tennent Limited, Coatbridge. Consulting Engineers: Ramsay and Primrose, Glasgow.

Composite boards can be supplied covering all the requirements of modern M.V. systems, the range of equipment including:

- Air circuit-breakers up to 3000 amps.
- Off-load isolators up to 3000 amps.
- Load-breaking fuse-switches up to 750 amps.
- Contactor gear for motor starting or other duty
- Distribution fuseboards
- Instruments, meters and relays of all types

Plus

- Modern styling and pleasing appearance
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NEWS SHEET

Switchgear standardisation brings savings for manufacturer and user, says D. E. Lambert, of Brush. Reduction of variety of requirements by users can save expense and time. Higher British safety requirements can make export difficult on price ground. (707, 709)

Yard, pound-mass, defined in international metric standards in new Weights and Measures Bill. Electrical units also referred to international definitions. Nine-man commission to advise BoT on measurements and units generally. (707)

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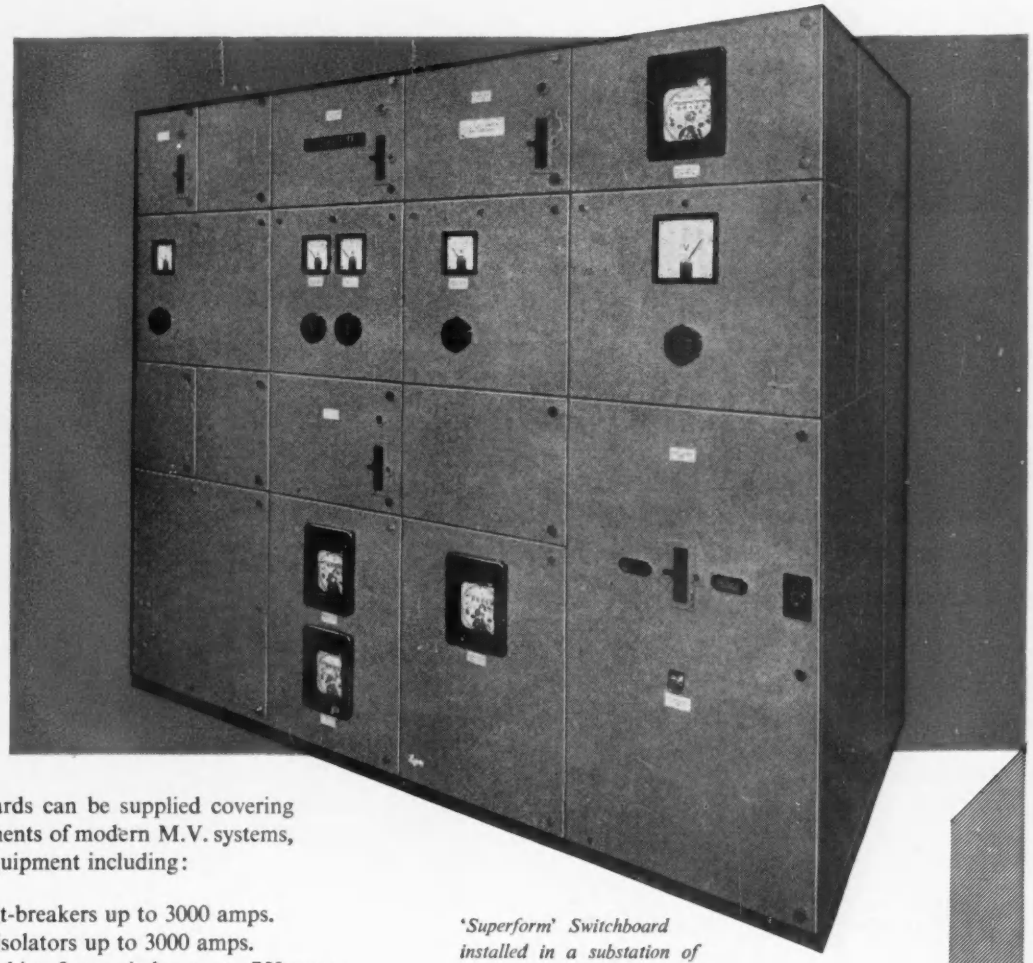
for all industrial distribution schemes



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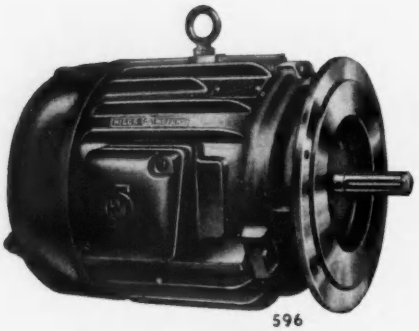

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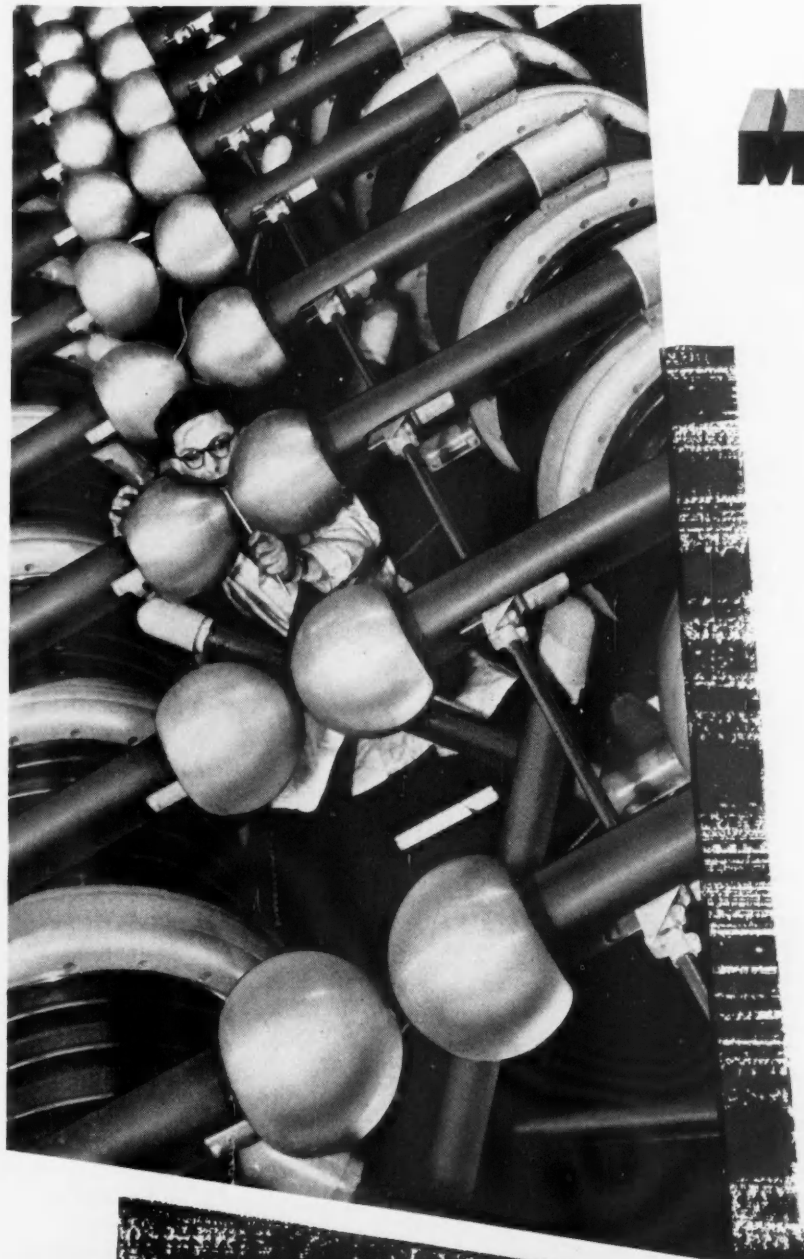

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Ferranti are specialists in the design and manufacture of A.C., D.C. and Impulse Testing Equipment for the development of high voltage generating, transmission and distribution plant.

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FT259/2

10 TIMES BETTER OFF WITH CLASS H MOTORS

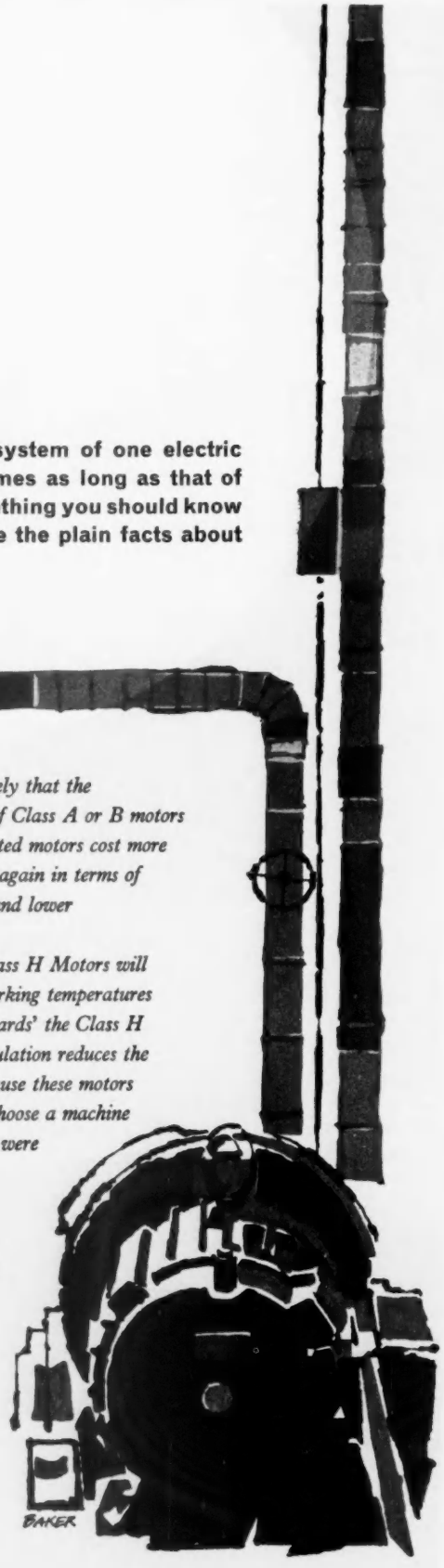
If the insulation system of one electric motor lasts ten times as long as that of another—it's something you should know about! So here are the plain facts about Class H Motors.

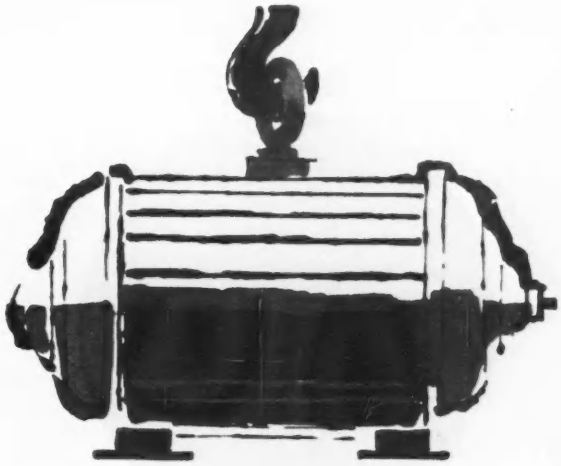
***Continuous** running tests have proved conclusively that the insulation life of Class H machines outlasts that of Class A or B motors by* more than ten times. *Although silicone-insulated motors cost more initially, the extra outlay is repaid time and time again in terms of lower replacement costs, lower maintenance costs and lower production losses due to breakdown.*

***No** matter how testing the working conditions, Class H Motors will take the strain. High humidity levels . . . high working temperatures . . . heavy overloads. All these 'occupational hazards' the Class H Motor can take in its stride since MS silicone insulation reduces the risk of breakdown to the very minimum. And because these motors are so resistant to overload, it's often possible to choose a machine of lower capacity than if a Class A or B machine were being used. Result—still further economies.*

***So** don't imagine that the Class H Motor is in the 'luxury' class . . . something to be specified only in exceptional conditions. On the contrary, a silicone-insulated motor is today's first choice—no matter what the circumstances!*

MS





REMEMBER SILICONES FOR REWINDS TOO

The value of silicone insulation is by no means restricted to new machines. Many a troublesome Class A or B motor—given to repeated breakdowns—has been totally transformed by a timely silicone rewind.

At the Latchford Locks Works of the British Aluminium Co. Ltd. a centrifuge, used for cleaning aluminium swarf, is powered by a 15 HP motor which is mounted beneath the centrifuge. To help in the cleaning, live steam at about 10 psi is admitted to the centrifuge while it is in motion. The motor, when new in 1954, was wound with Class A insulation, but failed after eight months due to condensation on the windings. Rewound with Class A it failed again—this time after only two weeks' service. To prevent repetition of these failures the motor was then rewound using silicone insulation, and in fact ever since it was recommissioned in May 1955, British Aluminium report, 'the centrifuge has been used almost constantly without further trouble with the motor windings'. They go on to say, 'There is no doubt that the employment of silicone insulation has greatly lengthened the trouble-free working of the winding of this motor.'

***Amongst** the leading manufacturers of Class H motors are: Associated Electrical Industries (Rugby) Ltd · The English Electric Co Ltd · The General Electric Co Ltd · Bruce Peebles & Co Ltd · Woods of Colchester Ltd · Brook Motors Ltd · Lancashire Dynamo & Crypto Co Ltd · Brush Electrical Engineering Co Ltd · Howells Electric Motors Ltd · Laurence, Scott and Electromotors Ltd.*

For a list of names of the many rewinders experienced in the use of silicone insulation, contact your nearest Midland Silicones branch office.

All over Britain, MS silicones are strengthening the weak link in electrical equipment—its insulation. Midland Silicones Ltd manufacture a full range of silicone products for use in the electrical industry. And Midland Silicones Ltd consistently set the pace for progress in this fast-developing field.

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MSE 4

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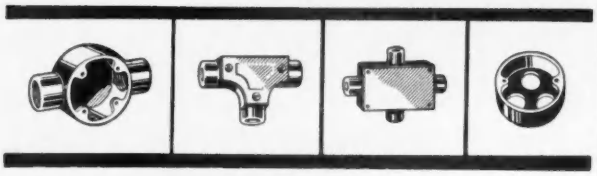

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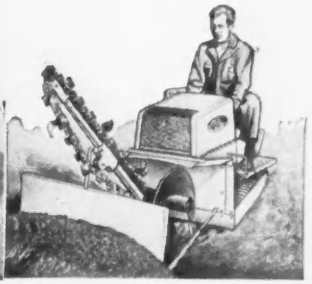
The trencher you've been waiting for

The ALLEN 3/12



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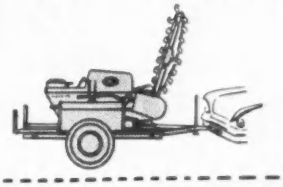

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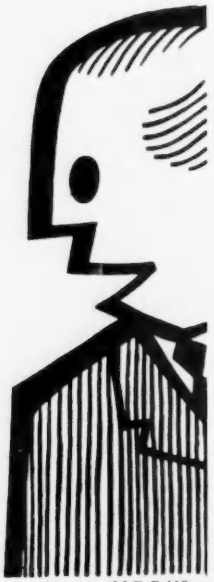

M.R.P.118

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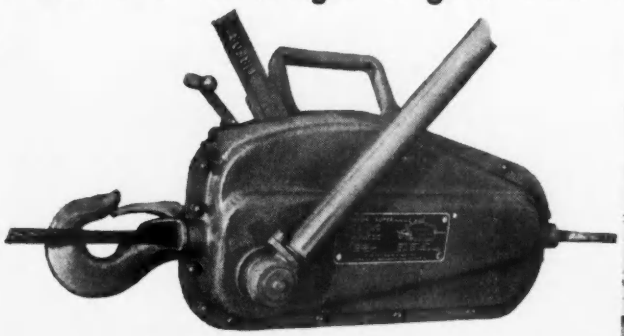

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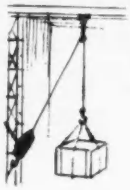
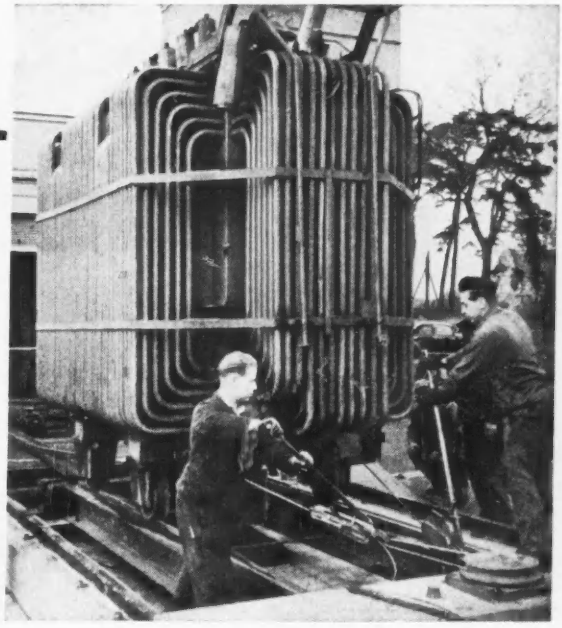


Installing transformers . . . Erecting power-lines . . . Loading, hauling, lifting or lowering, the powerful TIRFOR machine gives a controlled, reversible pull over any distance. It can be used anywhere. It is carried and hand-operated by one man. The TIRFOR T13, with a mechanical advantage of 43, lifts a ton. The TIRFOR T35, with a mechanical advantage of 85, lifts 3 tons.



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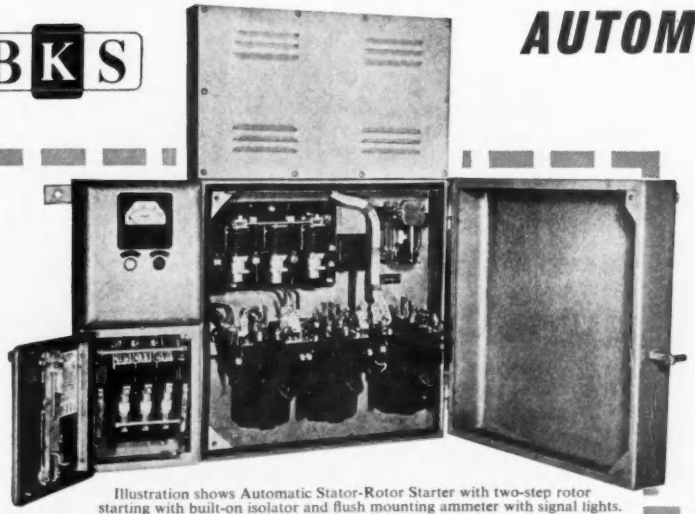

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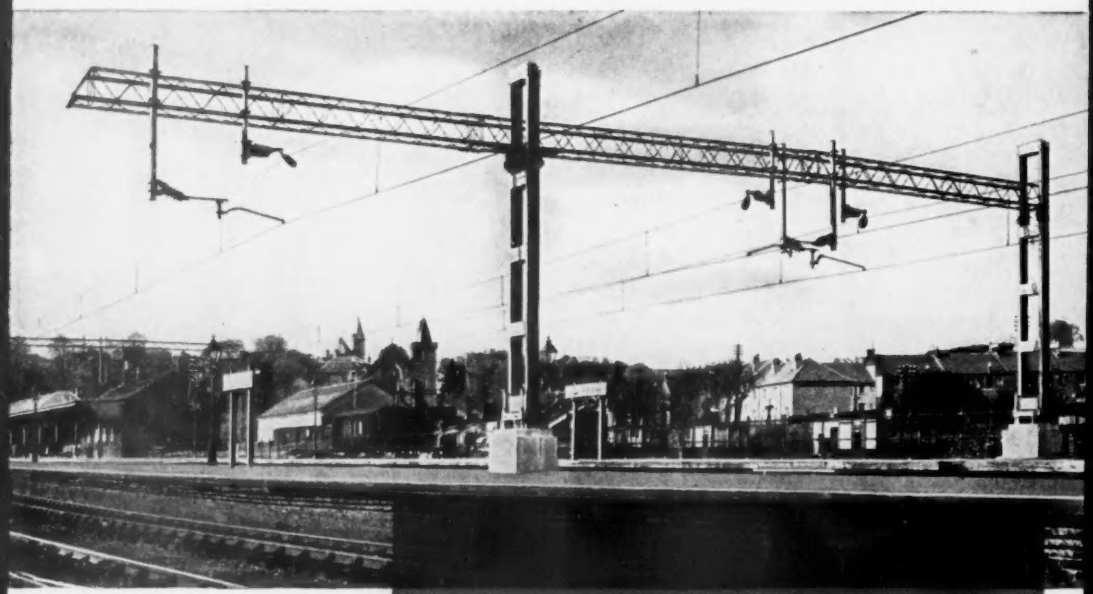

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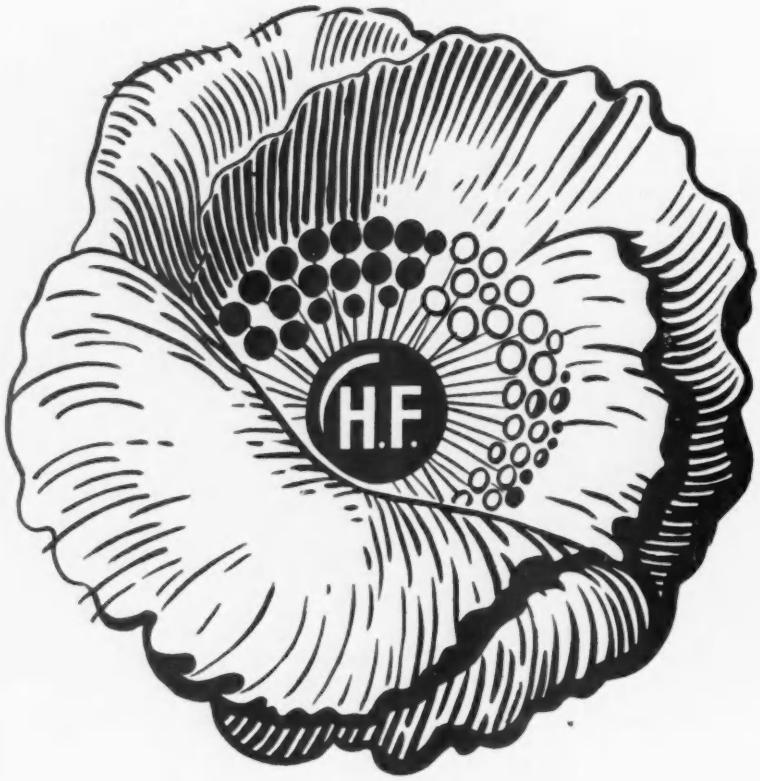

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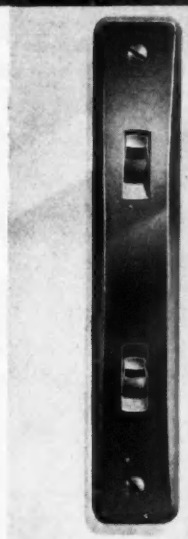
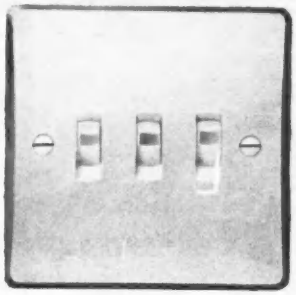
just a minute!

that's all it takes to instal the 'MUTAC CLIPPER'

ARCHITRAVE SWITCH ASSEMBLY



PLASTER DEPTH SWITCH ASSEMBLY



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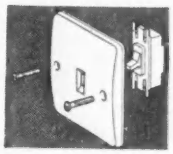

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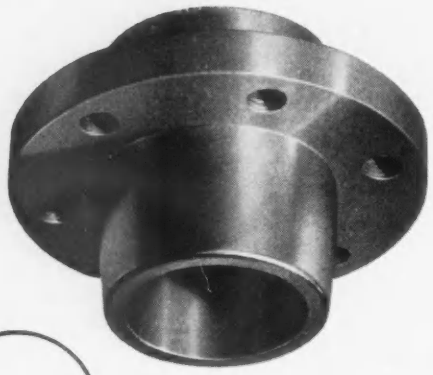

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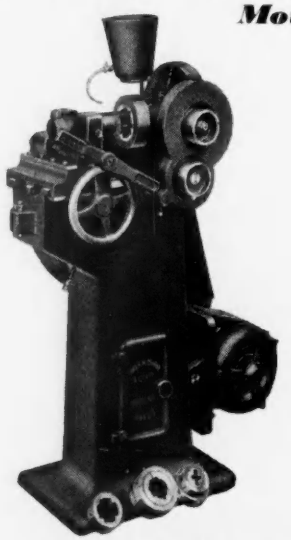

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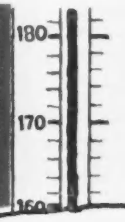

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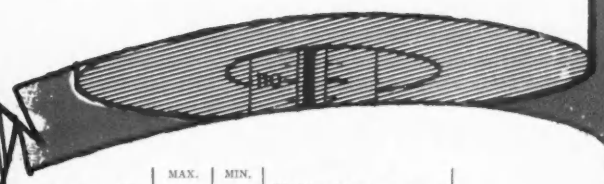

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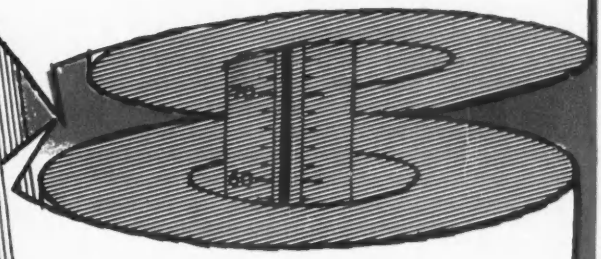

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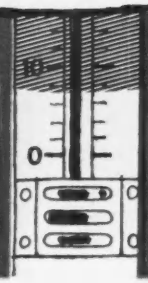

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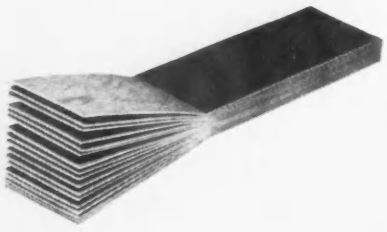

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THURSDAY 10 NOVEMBER, 1960

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ELECTRICAL TIMES

SARDINIA HOUSE, SARDINIA STREET, LONDON, W.C.2

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Modern Aspects of Switchgear Standardisation ... **709**
by D. E. Lambert, B.SC.(ENG.), M.I.E.E., MEM.A.I.E.E.

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Potential Dividers for Field Supplies **727**
by a Correspondent

European Power Plant Survey **728**

Thermo-electric Cooler in Production **728**

Dans ce numéro

Rationalisation du Mécanisme de Commutation ... 709

Il est possible aux usagers de mécanisme de commutation de réaliser des économies si ceux-ci coopèrent avec les manufacturiers dans le but de réduire la variété des besoins associés à ce qui est fondamentalement un modèle de coupe-circuit. Si la plus grande clientèle, tels les services de distribution d'énergie, devait consentir à resserrer ses besoins, il serait peut être alors possible d'accélérer les commandes en réduisant de beaucoup le temps consacré à l'atelier d'études. L'attention des fabricants en vue de réduire la variété des accessoires tels que collets de câbles pourrait resulter en des économies appreciables.

Côntrole pour Moteur type Marin 1ère Partie ... 715

Le mécanisme de contrôle pour les moteurs courant alternatif à bord d'un navire devrait incorporer des isolateurs d'arrivée de charge. Les contacteurs devraient fonctionner d'une manière satisfaisante lorsqu'ils sont inclinés vers la verticale, ce qui normalement nécessite l'ajustage de ressorts additionnels de distance, contrairement à l'usage à terre. Le débit mécanique est normalement léger, mais la disposition du contact devrait être telle qu'il ne se produise aucune possibilité de soudure.

Matérial d'Eclairage pour Théâtre 719

L'Eclairage des théâtres est un mélange de contrôle et d'illuminations de la technique électrique. La mise au point des systèmes de contrôle dans le but de satisfaire aux besoins de théâtres modernes et studios de télévision tendent plutôt à surpasser en éclat le rôle que jouent les unités d'éclairage elles-mêmes. Ce sont ces unités que considère le metteur en scène dans sa préoccupation constante de créer l'ambiance. Les techniques varient d'un pays à un autre et l'équipement perfectionnné au cours des 25 dernières années dans les trois écoles principales de l'Allemagne, de la Grande Bretagne et des Etats-Unis est en ce moment à l'étude.

In dieser Nummer

Rationalisierungsvorschläge auf schalttechnischem Gebiet 709

Eine Senkung der Gestehungskosten der üblichen Schaltanlagen wäre dadurch zu erreichen, dass die Verbraucher im Einvernehmen mit den Herstellerfirmen darauf verzichten, Abweichungen von der im Grunde einheitlichen Ausschalterbauart zu verlangen. Würden sich Grossabnehmer wie z.B. die Stromversorgungsbehörden dahingehend einigen, ihre individuellen Anforderungen einzuschränken, könnten Lieferungen infolge der Arbeitsvereinfachung im Konstruktionsbüro auch schneller durchgeführt werden. Weitere Einsparungen liessen sich durch Verringerung der Anzahl der hergestellten Typen von Zubehörteilen wie z.B. Einführungshälsen erzielen.

Schiffs-Hilfsmotorensteuerungen, I 715

Die Steuerung eines Schiffswechselstrommotors soll mit einem Reihentrennschalter ausgerüstet sein und Schütze aufweisen, die auch in geneigter Lage verlässlich ansprechen. Hierzu ist es in der Regel erforderlich, zusätzliche Abziehfeder einzubauen. Obwohl eine nur geringe mechanische Beanspruchung zu gewärtigen ist, soll die Kontakteinrichtung so beschaffen sein, dass keine Verschweissungsgefahr besteht.

Bühnenbeleuchtungs-Einrichtungen 719

An der Bühnenbeleuchtung sind Steuerungs- und Beleuchtungstechniken gleichermassen beteiligt. Entwicklungen auf dem Gebiete der Steuerungstechnik, die zur Bewältigung der durch den modernen Theater- und Fernsehbetrieb entstanden sind, haben bisweilen die Rolle der eigentlichen Beleuchtungskörper in den Hintergrund gedrängt, obwhl die von der Regie erstrebten Lichteffekte letzten Endes hiervon abhängig sind. Die in verschiedenen Ländern angewandten technischen Lösungen weisen starke Unterschiede auf und die in den letzten 25 Jahren entsprechend den drei Hauptrichtungen in Deutschland, England und den Ved. Staaten von Amerika entwickelten Systeme werden miteinander verglichen.

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ELECTRICAL TIMES

ESTABLISHED 1891

THURSDAY, 10 NOVEMBER, 1960

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K. C. POUNDS, B.Sc.(Eng.), A.C.G.I., A.M.I.E.E.

News Editor:
T. W. WRIGHT

Comment

SAVING SWITCHING COSTS

Switchgear at heart consists of the circuit-breaker; for control gear it is the contactor. But when it comes to manufacture many auxiliary devices ranging from operating mechanisms to cable glands complicate such simplicity and multiply the number of designs that leave the factory. Users have their own ideas of what they want in such auxiliary details, and if they are controlling the placing of a contract worth some hundreds of thousands of pounds, as is common enough, they are likely to find manufacturers disinclined to argue. Yet the interests of the users as well as that of the manufacturers would be better met by accepting some limitation of choice. Drawing office and assembly time are much extended by the need to meet individual requirements, and the danger of errors in assembly and of subsequent expensive rectification is increased when each job going through the shops is one-off, or nearly so; and in the long run it will be the customers who pay. An article this week draws attention to this question in respect of switchgear and gives some idea of what may be achieved by standardisation and its modern extension, variety reduction. Co-operation with some large customers—one electricity board is mentioned especially—has secured valuable savings by way of agreement on basic layout for the more commonly required arrangements of auxiliaries with specific switches. Where there is a single customer, or a well-organised group of industrial users, more attention than at present should be given to agreeing such details. One does not have to go far at present to see, say, control gear ordered by different offices of the same organisation for the same task being built with radically different arrangements, for all it incorporates the same contactor. That is unnecessarily expensive. To set it right is an administrative effort likely to pay off in cash saving.

WEIGHTS AND MEASURES BY ORDER

Metric measurements become the overlords of traditional English units under the Weights and Measures Bill which is now before Parliament. All the fundamental definitions of Imperial system units will in future depend on the international definition of the metre and the kilogram. The time-honoured "Mr Baily's Metal No. 1" standard yard of 1845 is due to become liable to a four-decimal-place check from the international determination of the metre, in terms of the wavelength of light emitted by Krypton 86: pound and kilogram will be firmly linked. That will be welcomed by precision engineers, who have been working to limits too fine readily to accept the uncertainties of a standard based on a physical

object. And the highly complex Bill, with no less than 55 pages of schedules in a total length of 106 pages, goes further than that in rationalising the scientific aspects of measurement. Amp, ohm, volt and watt are brought into its ambit, with a requirement that the Board of Trade shall draw up definitions reflecting the international definitions for those units. Basic to these changes is to be the establishment of a nine-man Commission on Units of Standards and Measurement, which will keep the question of definition of units and of physical standards under review. Recommendations of this Commission will be given effect through the relatively simple process of the Statutory Instrument, subject to specific approval by Parliament in each case—though the right to abolish the Imperial system and go wholeheartedly metric by this route is specifically withheld. Although the provisions of the Bill about everyday measures and the information to be given to customers will be most in the public eye, the changes in fundamentals are important on the borderline of science and industry.

INVESTMENT IN SUPPLY

The first of the promised annual autumn White Papers on investment in the public sector, which we noticed briefly last week, proved to add little to what was already known about electricity supply plans. The significance of the overall study the White Paper presents is centred more on broad national financial policy than on individual industry details, but it is noticeable that the supply industry is being given freedom to expand and that there is recognition again of the needs of distribution as well as generation. It is reassuring to see endorsed in this Treasury document the truism that "once work has begun on a project it is usually uneconomic to attempt either to accelerate or retard it as an instrument of general economic policy." This has been well demonstrated in the past history of electricity supply, and it must be hoped that the dictum will be kept to the fore of Treasury thinking if the future should become difficult.

GOOD INTENTIONS

Reports on consumer goods published in *Which?*, the magazine of Consumers' Association Ltd., have been criticised from time to time in these columns because of the tendency to base too firm conclusions on too few tests. As Consumers' Association has grown more prosperous through increased popular support, standards of testing have improved; but the results bring out more clearly than before the remaining shortcomings of those standards. This month it is the ubiquitous electric lamp that comes under the inspecting eye of *Which?*. The tests carried out make a real attempt to tackle inevitable variations in quality, with 50 nominally identical lamps of each of nine brands, tested for life and for efficiency at various stages throughout life. In discussing the results, attention is given to considerations such as the relatively high importance of long life rather than high efficiency when lamps are inaccessible for replacement. But this altogether welcome attempt at dependable accuracy is in part discarded in the obstinate attempt to find a "best buy." An apparently arbitrary choice is given, based on a table of total cost (lamp plus energy) for 600 lumens for 1,000 hours. The table, for some unexplained reason, excludes what appears to be the lowest total cost performer, and the recommended type is only second cheapest amongst those listed. Worse, the report concludes with an unobtrusive paragraph emphasising, correctly, that since the tests were made on 240 V, 60 W pearl bulbs, the relative results must not be taken to apply to other types and ratings of the makes of lamp tested. It seems cynical to publish the report if that warning is indeed intended to be respected. Housewives who follow *Which?* selections will doubtless ignore it. Despite the effort at more adequate testing, the recommendations are again too firm.

TRAINING IS A GOODWILL EXPORT

At any one time, there are about 4,000 graduate engineers from overseas undergoing practical training with industrial organisations in Britain, compared with perhaps 7,000 British graduates. That is an FBI estimate covering all branches of engineering and it sets the background for a discussion last week on the circumstances in which such men are trained. Realism is easily lost to idealism when such questions are considered. It is necessary to keep in mind, as the boards of the individual companies who receive them certainly will, that training for the 4,000 visitors is not wholly an altruistic gesture. Besides a wish to help, there is a desire to impress with the qualities of British engineering, to familiarise visitors with British practice, so that they will be more likely to become customers when they return to their own countries—and customers not only of Britain, but more particularly of the firm that trains them. Yet that end will not be gained if overseas trainees receive a bad impression of British standards, and it seems from the discussion that they may be in danger of doing so. They do not wish to be trained to British professional institution requirements; they want to learn less about production, more about how to be knowledgeable purchasers, skilled operators and maintenance organisers. Because of this, they do not fit in easily with the training schemes organised for their 3,500 British fellow-graduate trainees. Above all, they want to be in touch with practising professional engineers, rather than the skilled technicians who play the major part in many British training schemes. The discussion last week hinted at more Government help in finance and staff to bridge the gap between small-firm reality and longer-term national interest in this matter, and that is a question which clearly deserves consideration, for the training load on the largest firms is already unduly onerous.

Meteor

This week's quick summary of electrical news faces advertisement page 8

Modern aspects of switchgear standardisation

by D. E. Lambert,* B.Sc.(Eng.), M.I.E.E., Mem. A.I.E.E.

MANY papers and articles have been written on the subject of standardisation of switchgear, and more are bound to come in the future as the results of scientific research and development are applied both to the technical and production engineering aspects of switchgear. During the last decade much progressive development has taken place in the transmission and distribution of electricity, in switching devices, in materials and in manufacturing techniques. No comprehensive consideration of switchgear standardisation would be complete without reference to "Rationalisation," in the sense of the reduction of the number of different types and constructions and the concentration of research and manufacture for efficient production. During recent years the British Productivity Council have been largely responsible for introducing the term "Variety Reduction," which has much the same import as rationalisation. They have emphasised the need to achieve by this means greater productivity and more economic manufacture.

It is a good thing in any industry or organisation to take stock periodically of existing practices and products, to ascertain whether the best use is being made of new developments in techniques and in materials, whether an overall economy can be achieved and whether policy is directing efforts in the right channels. Standardisation should keep pace with such developments. Generally it should follow practice, but there are instances when it can and should proceed in parallel.

* Mr Lambert is with Brush Electrical Engineering Ltd.

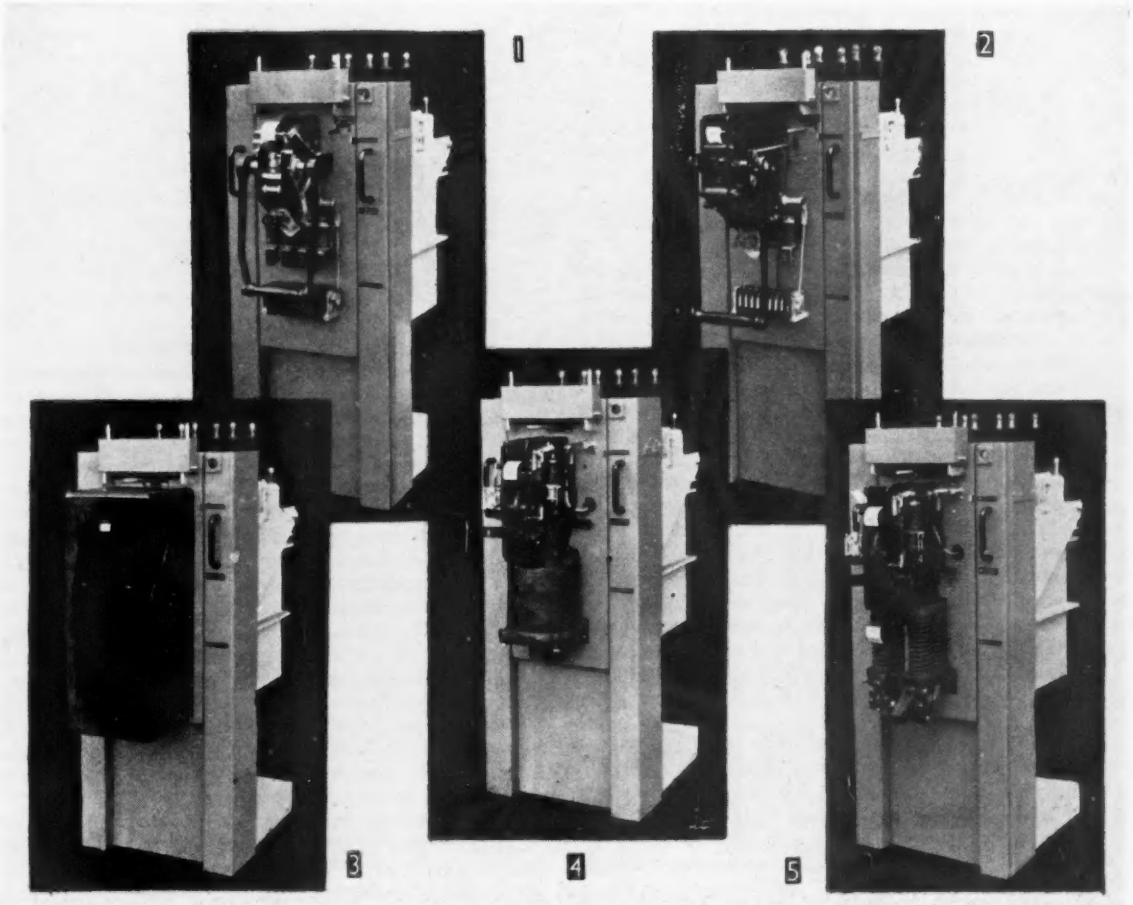


Fig. 1. Alternative types of 6·6/11 kV circuit-breaker operating mechanisms. 1. Manually-operated mechanism. 2. Manually-operated mechanism with assisted spring closing. 3. Circuit-breaker mounted on truck with mechanism enclosed. 4. Spring-closed mechanism. 5. Solenoid-closed mechanism. The manufacturer may be asked to supply all these mechanisms for effectively the same circuit-breaker

Some aspects of the present position with regard to switchgear standardisation are given in this article, and particular reference is made to variety reduction in the range of switchgear up to 11 kV.

International and National Standardisation

Each year progress is made in the meetings of the International Electrotechnical Commission towards the unification throughout the world of technical standards for switchgear. The work is undertaken by two committees, one dealing with switchgear with voltage ratings above 1,000 V and the other with ratings of 1,000 V and below.

The committees concerned have been most active and a number of publications have already been issued during the past few years. In the high-voltage and extra high-voltage fields, these have covered "Recommendations" for circuit-breakers in respect of short-circuit testing, normal load conditions, insulation, selection, and erection and maintenance. At the present time, consideration is being given to Recommendations for switches and isolators, for circuit-breaker switching of overhead lines, of cables, of capacitor banks and of small inductive currents. In the medium- and low-voltage field, comprehensive Recommendations have been prepared for circuit-breakers for distribution service and for contactors. The current work covers the finalisation of these with associated considerations of insulation and protective enclosures. Another specification for circuit-breakers for more onerous conditions (e.g., control of power station auxiliaries and vital industrial plant) is under discussion. Meetings of both IEC Committees take place in New Delhi this month.

All this work would be of academic interest only without the implementation of these IEC Rules by countries of the world in their own national standards. This is being done slowly but surely, and it will mean in due course that switchgear, and in particular circuit-breakers, with given voltage, normal-current and breaking-capacity ratings will have the same technical performance irrespective of their country of manufacture.

Britain can claim to have led in many aspects of this work and the results achieved, which in general line up closely with British Standards, are some compensation for the not inconsiderable cost expended by all sections of the electrical industry in this country on this work.

It is also true to say that so far as equality of technical performance is concerned, the results should have a marked significance in any future European Common Market arrangements. Acceptance of IEC recommendations would undoubtedly be a solid foundation for the building of a common technical structure. The commercial aspect, however, is not so clear, as prices quoted by the various European manufacturers will depend on many other factors, not the least among them being standards of safety accepted in the various countries as operational requirements. One example of this is interlocking against inadvertent faulty operation of one sort or another, which is considered to be of great importance in this country, but is not viewed with quite the same emphasis on the Continent.

As regards implementation of IEC standards in this country, committees of the British Standards Institution are constantly reviewing and revising standards for switchgear. For example, an amendment to BS 116:1952, "Oil Circuit-breakers for Alternating Current Systems," has recently been issued, dealing with short-circuit testing, in which many requirements of IEC rules and of established practice at ASTA Testing Stations have been incorporated. Similar remarks apply to the recently published specification BS 936, "Oil Circuit-breakers for Medium-voltage A.C. Systems." This supersedes the War Emergency Edition of the specification. (See ELECTRICAL TIMES, 22 September, 1960.)

Another specification, BS 162, "Electrical Power Switchgear and Associated Apparatus," is about to be issued in revised form. The previous edition was published in 1938 and there are obviously many changes to bring this standard into line with current practice and recent developments. An important revision of the standard concerns safety requirements for outdoor open-type switchgear. The 1938 edition, whilst giving some general guidance on this matter, has been considerably extended and more precise illustrations have been included to indicate the clearances required for maintenance of the apparatus and showing delimitations of work sections, with special regard to conditions in the United Kingdom.

Impulse-voltage withstand levels have been introduced for open-type outdoor switchgear at service voltages of 22 kV and above, and clearances to earth and between phases are related to these impulse voltages. Two entirely new sections have been added to the standard. One of these deals with control, metering and relay equipment, and the other specifies requirements for battery and compressed-air auxiliary systems.

Appendices have also been included on insulation co-ordination and on the selection of clearances.

The same BSI committee is also finalising a revision of BS 158, dealing with marking and arrangement for switchgear busbars, main connections and small wiring. This standard is being considerably simplified compared with the previous 1938 edition, and should enable manufacturers to reduce the variety of cables used for auxiliary wiring. In the latest draft it is proposed that all small wiring should be coloured black unless specified otherwise by the customer, and even then, only colours in accordance with a table setting out a limited number of them can be used. The main identification of the wires is by ferrules, and an appendix has been prepared which will cover functional identification (i.e., circuits) very much on the lines of that adopted by the electricity boards in this country. This should reduce drawing office work, particularly in diagram sections.

Variety Reduction or Rationalisation

There are two aspects of variety reduction as applied to switchgear. Both ultimately concern the manufacturer, but one is the responsibility of the user to effect reductions in the variety of his requirements and to simplify them. The other refers to reduction by the manufacturer in variety which can be achieved in considerable depth from design through manufacture to stocking and selling.

Since 1948 the generation, transmission and supply interests of the industry in this country have contributed a great deal towards standardisation by the unification of their own requirements in the form of switchgear purchasing specifications. These have resulted from thorough studies of system and operating conditions by the electricity boards, and many of the specifications have been prepared in collaboration with representatives of the switchgear manufacturers. In general, these purchasing specifications conform to British Standards. In some instances they are more severe to meet conditions or requirements peculiar to this country.

There is still the need for further reduction of variety of requirements. As an example, the British Electricity Board's Specification "S2" for 6·6/11 kV standard distribution switchgear has achieved prominence as a first-class basis of requirements for distribution systems (in spite of the nauseating colour of the original draft which led to its being referred to as the "Yellow Peril") and it is a compliment to its original authors, and also of consider-

able import to manufacturers at the present time, that some overseas buyers are quoting "S2" in their inquiries. Even so, there are a number of detail variations of the component equipment called for by one electricity board or another due to existing systems of control, or of protection, or because of standards previously well established, or because other electrical apparatus, for example transformers, may have a higher electrical standard in one particular technical aspect. In time, it is hoped that these variations may be unified, not by invoking the highest common factor, but by adopting the simplest common denominator which satisfactorily meets the overall requirements.

One electricity board has already standardised on six basic types of 6·6/11 kV equipment, covering the range from a switch without protection to a circuit-breaker embodying over-current and earth-fault protection, and with re-closing relays. The electricity board calls for a number of panels of type A to type F, and the manufacturer has standard arrangements, including wiring diagrams, to specify to his production engineers with the minimum of engineering or drawing office work. This kind of standardisation is beneficial to both user and manufacturer.

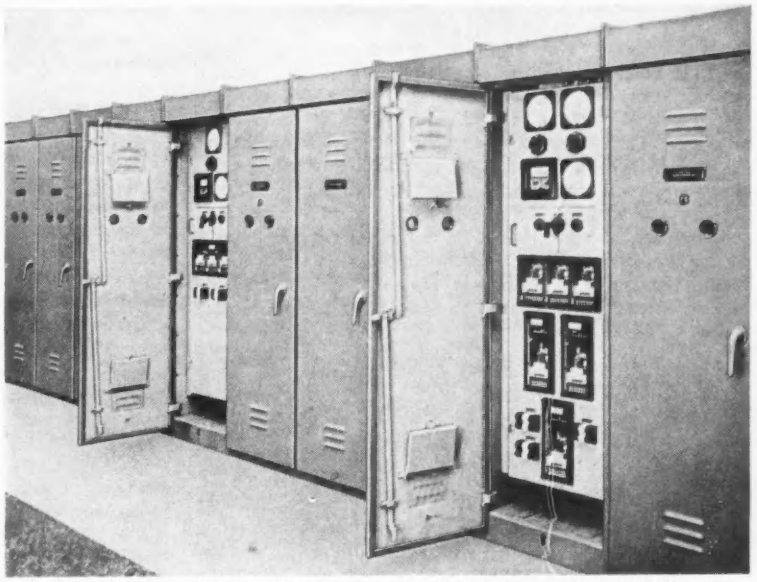


Fig. 2. Part of metal-enclosed outdoor switchboard showing control panels

It has been said, with some justification, that the situation existing today, with so many types of switchgear, circuit-breakers, switches, isolators, switch fuses, mechanisms, cable boxes, etc., is one which may be laid at the feet of the manufacturers. Often, this can be traced to the differing requirements of discerning purchasers, translated into being by the individual creative instinct of the designers.

There are certain components of switchgear which have been developed over the last few years to meet requirements of users and which have added to the variety of designs within a particular range. One example of this is operating mechanisms. For a 400 A, 11 kV, 150 MVA circuit-breaker, the more usual types of mechanism which the manufacturer is asked to supply are manual, manual operation with assisted spring closing, spring and motor wound spring and solenoid (Fig. 1). For the same range of switchgear of heavier current ratings, such as 1,200 A, or 1,600 A, a different spring mechanism or, alternatively, a stronger solenoid mechanism is usually required, and so the number of different mechanisms increases, the parts required increase and the stocks increase. Manual operation for circuit-breakers of ratings not exceeding 150 MVA at 6·6 kV and 11 kV has been the accepted type for the large majority of switchgear installations. This is the cheapest form of mechanism, but its correct operation is largely dependent on the skill of the operator. Now that satisfactory mechanisms have been developed incorporating a spring device in such a manually operated mechanism, it makes the closing operation of the circuit-breaker consistent and independent of the operator and should cost very little, if any, more than the straight manually operated mechanism. In the future, for the safety of operators and for reduction of variety, this more modern arrangement should replace manual operation, at least up to ratings of 250 MVA at 11 kV, and so eliminate one of the varieties.

At the present time in this country, in the voltage range up to 11 kV, technical requirements in relation to impulse voltage levels, to methods of earthing, and to overload ratings, are under discussion between users and manufacturers. It is not unlikely that changes in the design of component parts of the switchgear will have to be made to meet these requirements and this will also probably lead to an increased amount of testing. During the last ten years the manufacturer has been involved in making a considerably greater number of tests than hitherto and this has naturally resulted in increased costs.

Standards of Performances

One of the problems confronting switchgear manufacturers is, how to maintain the standard of performance and quality required in this country at a cost which will allow the product to be offered overseas at a competitive price. Assuming as a nation we must continue to export switchgear (in 1959 it was about £18·3 million), the need is greater today than ever before to reduce costs. Many of the Commonwealth markets which have been open to us are diminishing on account of import tariffs and local manufacture. There are other overseas markets which can be developed, but in many cases these will be more competitive than those we have enjoyed in the Commonwealth areas.

The manufacturer must therefore consider all aspects of cost reduction of the product, including reduction of variety, design, methods of production and the use of recently developed materials.

The sales policy of a manufacturing company largely determines the variety of products to be manufactured. Obviously, there should be a measure of diversity to give an adequate range to the products for customers, and also to avoid having "all one's eggs in one basket." Designers are responsible for evolving the minimum number of designs to satisfy the sales requirements, and it is essential for such designs to be evolved together with production engineers in order to produce the most economical unit from both the engineering and production aspects.

Many examples could be quoted of reduction in variety already achieved by manufacturers. One manufacturer decided to review his range of medium-voltage cubicle

switchgear and it was found that for a wide field of application there were 41 different designs of cubicle to meet the requirements. This combination was made up of two different heights, eight different widths, and six varying depths. After consideration from the design and production points of view, it was found possible to standardise on one height, and seven widths, three depths, thus resulting in only 16 different designs of cubicles. Furthermore, the method of construction and fabrication of these cubicles was standardised and has resulted in even greater cost reduction. Similarly, cable boxes and cable glands have been rationalised. By reducing variety and introducing pressings and mouldings for cable glands, production costs have been reduced to about 20% of the former figures.

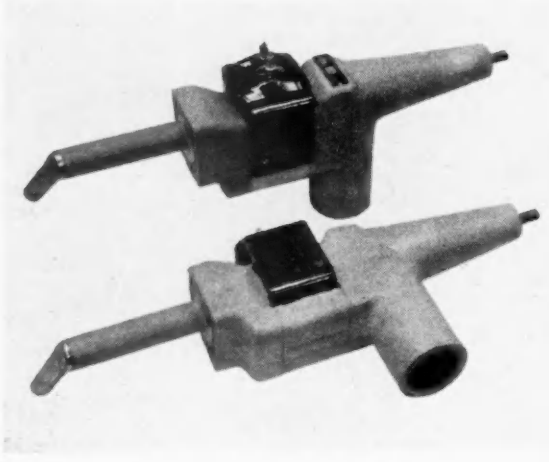
Instruments and relays are commonly known as "subject to contract" items. They are often mounted on panels above the switchgear. Benefits to both manufacturer and customer can accrue from standardisation of the positioning of instruments and relays on these panels. The "S.2" Specification, previously referred to, did, to an extent, cover this, but there are a very large number of other requirements for relay and instrument panels on which the equipment is specified to be mounted in defined positions. One manufacturer investigated the possibility of the standard positioning of components on alternator control panels and a large measure of standardisation was found to be possible. Not only were the positions of the components fixed, but the wiring diagram was standardised, and customers' extension panels were identical in this respect to previous ones supplied. There is still considerable scope for greater standardisation in this respect.

Types of Switchgear and Circuit-breakers

No great change in rationalisation of the types of switchgear has taken place during recent years. For the highest voltages in this country of 275 kV and 380 kV, and the breaking capacity ratings up to 15,000 MVA (or even greater)—outdoor open-type switchgear with air-blast and bulk-oil type circuit-breakers is still favoured.

At lower voltages, from 6·6 kV to 132 kV, small-oil-volume circuit-breakers are in limited demand in addition to those mentioned above. Both indoor and outdoor open-types of switchgear are available and at 11/15 kV and 33 kV greater emphasis is now being laid on the outdoor enclosed or package type switchgear both in this country and abroad. An example of this type is shown in Fig. 2.

Considerable advances have been made in the development of air-break circuit-breakers up to 11/15 kV application, following established practice for some years in



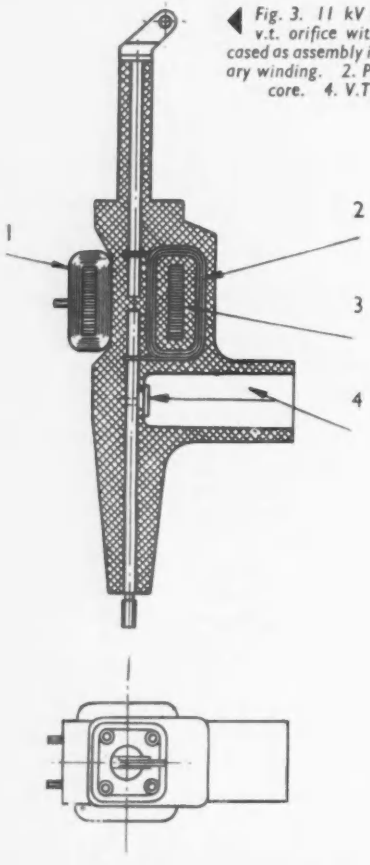


Fig. 3. 11 kV current transformer and v.t. orifice with central conductor encased as assembly in epoxy resin. 1. Secondary winding. 2. Primary winding. 3. "C" core. 4. V.T. orifice and contact

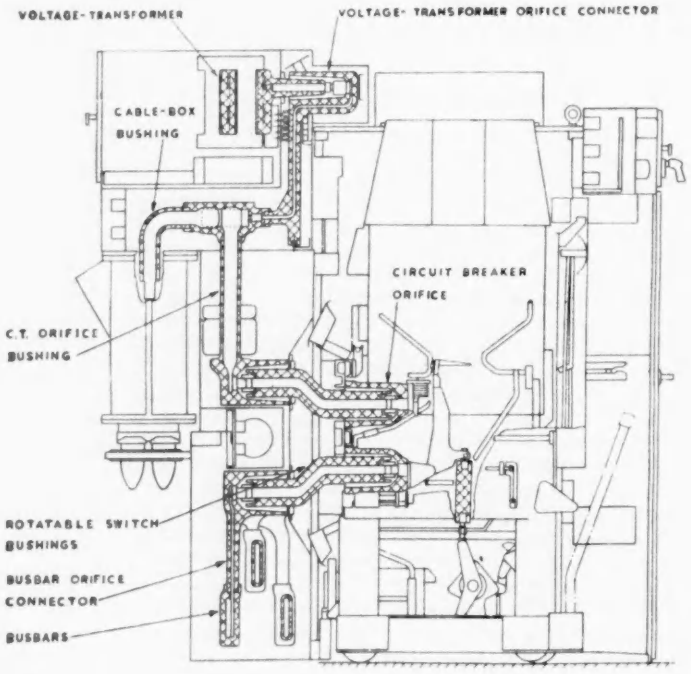


Fig. 4. Indoor air-break switchgear unit for 1,600 amp, 11 kV, 500 kVA, showing resin sub-assemblies. (Courtesy A. Reyrolle).

America. There is still a preponderant volume of bulk-oil type circuit-breakers sold in this market and it is likely to continue, particularly for normal current ratings up to 1,600 A.

In medium-voltage application, both air-break and oil-break circuit-breakers are being supplied, depending upon the service duty required and their location.

Mention must be made of the switchgear development which has taken place as a result of new materials and new production techniques associated with them. Plastics, epoxy-resins and other such insulating materials have not only been applied as a means of insulating connectors and live metal, but the whole design of the switchgear has been reviewed around the use of such materials which envelope or encapsulate the conducting parts. This work is continuing, particularly for voltages up to 11 kV, and Figs. 3 and 4 show examples of modern achievements.

Much research and development work has taken place in America and to an extent in this and other countries on vacuum-type circuit-breakers and to a lesser degree in the use of sulphur-hexaflouride (SF_6) as an arc-extinguishing medium. Both these types are in production in America but with limited application. One of the disabilities of the vacuum-type circuit-breaker has been "current chopping" and consequential dangerous over-voltages. This has tended to limit its performance on short-circuit to about 150 MVA at 15/18 kV, but recent information indicates that higher values of breaking capacity can now be obtained. With such developments taking place—the possibility of any standardisation and reduction in the number of types of circuit-breakers or of switchgear appears remote.

From the users' viewpoint, greater variety may add confusion in the choice of the most appropriate type, particularly bearing in mind the reliability and good service provided by existing designs.

The consoling thought is that British switchgear manufacturers are very much alive to the problems confronting them today, namely, the need to keep up to date and lead wherever possible in the development of newer and better switchgear, to simplify designs and generally reduce costs of production so that the product may be saleable competitively in this country and in the export market. Each manufacturer will have to make the choice of the types which he considers the right ones to produce, limiting the diversity of products consistent with market requirements to give economic manufacture and suitable profit return.

Readers Views

Correspondents writing under pseudonyms are asked to submit their names and addresses in confidence to the Editor

Late Deliveries

I AM SURE that your correspondent Mr H. J. Wilson has unwittingly misunderstood the purpose of the BEAMA's comment on the remarks made on the deliveries question. There is no question of complacency, merely the need to correct erroneous impressions abroad. The BEAMA was in fact invited by the overseas press to explain the circumstances of this particular case and the statement to which Mr Wilson refers was the direct outcome of this.

Recent achievements, with British electrical exports running at around £300 million, are good but have engendered no sort of complacency in the industry. The recent BEAMA Survey of the European Market and our close co-operation with the engineering trade associations of both the Six and the Seven indicate our awareness of the problems and possibilities of the European market.

The Commonwealth remains the major outlet for electrical engineering exports and the fact that we thought it necessary to correct a wrong impression which could damage our Commonwealth trade must not be interpreted as complacency.

S. F. Steward, C.B.E.,
DIRECTOR, THE BRITISH ELECTRICAL AND ALLIED INDUSTRIES MANUFACTURERS' ASSOCIATION,
LONDON, W.C.2.

Jumping for Safety

MR C. McALLISTER (ELECTRICAL TIMES, 3 November) is to be envied! Few persons, I imagine, would be so constituted as to retain their mental faculties unimpaired—much less their power of co-ordination—whilst gripped in the throes of a severe electric shock.

Judging from my own experience of two severe shocks, both on 200/240 a.c., one's muscles contract, something after the manner of rigor mortis and one feels that one is being torn limb from limb. It is an *awe-ful* experience, in the real meaning of the word, and one is practically beyond coherent thought and quite incapable of action.

The first time (I was 15 at the time) a number of carbon lamps included in temporary wiring went out, owing to a loose joint; the electrician being away for a short time, I jumped at the chance of repairing the fault and earning the thanks of the builders.

It was quite safe, for was I not standing on wooden steps? I was. But not for long! As soon as I started to re-make the joint with my bare hands. I was seized with the symptoms described above and was afterwards told that my screams could be heard the other side of the High street, and that the old building foreman was so upset that he could not eat his lunch. All I know is that I seemed to lose consciousness and next thing I was on the floor, still on my feet and cursing the workmen near by to the best of my ability for playing such a trick on me! (I thought at first that someone had somehow connected an earthed wire to the soles of my feet.)

The second time was three years ago in a switch room in Hobart, (Tasmania). This time, I had been checking for overheating on the switch-board, by touch. Medium voltage three-phase. I had finished my inspection and was idly standing at one end of the board awaiting the return of my assistant. Grasping the angle-iron upright with my left hand I casually grasped a neutral busbar with my right—to see if *that* was warm. It was! But it was not the neutral but the blue phase. I can only excuse this as a temporary mental aberration due to over-tiredness. Three thoughts only occurred to me in swift succession: I was alone. I could not get away. This was goodbye to everything. Next thing, after a seeming eternity, I was flung very violently against the wall and collapsed in a heap on the floor. It seemed incredible that I was still alive and still had the use of my limbs, with the exception of my left arm. It was found later that I had a fractured scapula, which kept me out of circulation for a few weeks. A merciful escape, I feel.

R. St. C. Ison.
CHELTENHAM.

Training overseas graduates

URGENT PROBLEM FOR BRITISH INDUSTRY

OVERSEAS graduate engineers come to Britain in large numbers to receive practical training. As many as 4,000 may be training at any one time. Is all well with the arrangements that apply to them? Do they leave with the sort of impression of the UK that will encourage them to deal with Britain when they attain positions of responsibilities in their own country? These questions were talked about at a joint meeting of the three senior engineering institutions in London last week, when a paper* was presented by Dr W. Abbott, who is director of studies with the Federation of British Industries.

Dr Abbott is outspoken in his paper; he was still more forceful in his oral presentation of it. He thinks the state of present training schemes gives rise for disquiet, not only for overseas graduates but for our own graduate engineers as well. He fears too much accent on craft skills and not enough contact for the trainee with professional engineers, although the electricity supply authorities were specifically excluded from this charge.

Dr Abbott suggests that although it is necessary for professional engineers to know about techniques in use, those techniques change rapidly and it is important not to stultify youth by giving them too close an acquaintance with old techniques.

Training Problems

In his paper, Dr Abbott says that there are two main types of engineer wishing to come for training in the UK. One is the young graduate with little or no experience, the other the mature engineer with considerable experience who requires up-to-date information. Too often, the graduate finds himself regarded as an apprentice. His training is controlled by an apprentice supervisor interested in giving him craft skills. Sometimes, because of trade union practices, he can only observe, not take part in work, and he becomes bored. Less trouble is found in giving experienced engineers what they require.

An important point that needs realising about graduate trainees from overseas is that they are often not interested in becoming members of British engineering institutions; so schemes of training that satisfy institutions' requirements have no particular merit from the graduates' viewpoint. A common complaint of engineers concerned with industrial products is that the training is designed to fit the trainee to become a producer, whereas the requirement overseas is for men able to purchase, install, operate and maintain. Often, overseas graduates are not interested in becoming the "complete engineer" in the British sense of the term. Frequently, the trainee would prefer to spend time with several firms rather than stay with one.

Another complaint often voiced concerns the difficulty overseas trainees have in obtaining answers to the questions that they wish to put about technical matters. Their lack of contact with professional engineers has already been mentioned. Dr Abbott says:

> If management believes that it is good policy to receive into their works for training selected men from other countries, who are destined to become industrial leaders in those countries, it would appear that management should give much more attention to this particular question. Otherwise, the outcome of the graduates' stay with us will not always enhance our national engineering reputation.

Dr Abbott recalls that the late Sir Claude Gibb felt particularly strongly on this point and urged a new approach in respect of it upon directors of firms likely to be involved.

Future Action

After discussing the impact of life in the UK on overseas trainees, Dr Abbott points to the lack of statistical information about the amount of training of overseas graduates at present given in this country. He feels the Government might help obtain more reliable figures.

Dr Abbott acknowledges that some of the smaller firms who might be prepared to play a part in training overseas engineers can reasonably argue that they cannot do the job effectively unless they are assisted financially.

DISCUSSION

MR S. E. GOODALL (AEI) in opening the discussion, appealed to younger professional engineers in particular to ensure that they got in touch with any overseas graduate trainees they could, to help and advise them. He agreed that from the commercial angle, to give more attention to the requirements of overseas graduates would pay dividends.

Another electrical speaker in a discussion which attracted many contributions from the other branches of engineering was MR R. G. BELLAMY (Electricity Council) who said that in the last ten years the supply industry had taken over 1,000 people from 66 countries for training. He agreed with Dr Abbott that the common denominator with overseas graduates was intellectual curiosity, a desire to make full use of their potential, and to meet and know British people. Training schemes, he felt, should be flexible.

MR R. F. MARSHALL (AEI) suggested that to flit from place to place in training caused the lack of social contacts and absence of contact with professional engineers that had been complained about. MR J. M. STOCK (Uganda EB) expressed surprise that the countries of East and West Africa were omitted from the FBI scholarship scheme; they had an enormous potential demand for engineering products. The time available for Britain to help was limited, for other countries would take advantage of the present situation if the UK did not.

MR G. S. LUCAS (AEI) thought that one object of graduate training should be to give a man confidence to stand on his own feet when all the apparatus for which he was responsible had broke down, and he had to get it going again.

Various graduate trainees spoke in the discussion, voicing mixed views. Dr Abbott, in his reply, paid tribute to the training scheme of AEI, which he called "nearly perfect."

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* Paper 3358: The training of overseas graduate engineers with particular reference to the FBI scholarships scheme, by W. Abbott, C.M.G., O.B.E., PH.D., B.SC., M.I.MECH.E.

Motor control gear for alternating current ships

by R. A. F. Craven,* A.M.I.E.E.—Part 1

CONTROL-GEAR engineers and users gained much experience in the design, performance and utilisation of a.c. motor control-gear for marine use when a.c. was adopted by the Admiralty for RN ships shortly after the war. What has always attracted industry and now attracts shipbuilders about the use of a.c. is the high reliability and low maintenance needs of the squirrel-cage motor and if these advantages are to be exploited it is clear that motor control-gear must be just as free from trouble and equally robust.

Weighty technical problems are involved in the design of contactors and relays (especially in their a.c. magnetic systems) when they are asked to withstand the Admiralty standard shock test; but fortunately control-gear for merchant ships does not have to withstand this test, and it is only in the adaptation of relatively standard industrial control-gear to marine work that some minor problems have arisen.

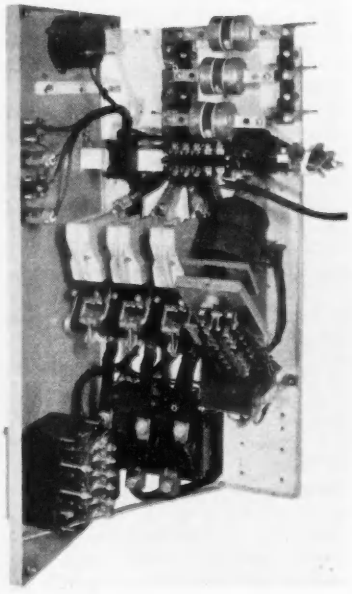
Easy maintenance is never more desirable or necessary than on board ship. The first essential for motor starters is front access, while starters with withdrawable interiors are even better. The advantage of the multi-motor control centre has been recognised fairly recently and a typical example is shown in Fig. 2, where there is a group of starters for motors ranging from 5 h.p. to 150 h.p. Fig. 1 illustrates a control centre with draw-out starters.

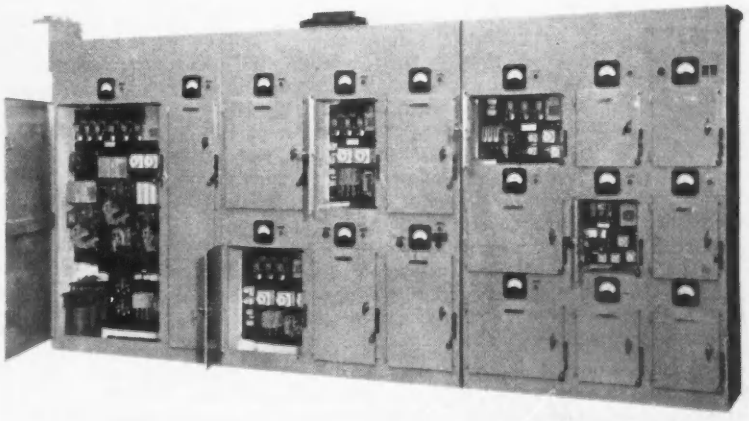
The general design and appearance of this type of equipment is very similar to its industrial counterpart. It has a busbar chamber running the length of the board, either at the top or bottom, with vertical tee-connections (risers) feeding each section of tiered starters; in each section there may be one to four or more units. Each starter has its own h.b.c. fuses and isolating switch. It is better for the isolating switch (or disconnect switch) to be capable of interrupting stalled motor current so as to eliminate mechanical interlocking between the isolator and contactor; this type of disconnect switch is being used more and more in industrial motor control centres, especially where high reliability is needed.

To be able to withdraw starters for maintenance is an obvious advantage for shipboard use where working space is usually restricted and maintenance work in heavy seas very difficult. Draw-out units for motors larger than 100 h.p. or for auto-transformer starters become unwieldy and normal built-in, front-access starters are used; they can nevertheless still be embodied in the same control board as the draw-out starters.

The enclosure is constructed and finished so as to withstand both heavy usage and high humidity. This is equally true of single starters and multi-motor starters.

It is good practice to construct busbar systems sufficiently robust to withstand the electromagnetic and thermal effects of short-circuit current. And although prospective fault levels of, say, 25 MVA can only occur on larger ships, many control-gear manufacturers customarily construct their busbars to withstand 36 kA rms (i.e. 25 MVA at 415 V) for periods up to three seconds as a standard. Some idea of the problems involved in the design of busbar and busbar connections is given by considering that the peak force between bars spaced at 3 in. is about 2 tons/ft run for a 36 kA rms (96 kA asymmetrical peak) fault current.





Figs. 1 and 2. Left, Draw-out type starter unit, 300 amp d.o.l. (AEI). Below and right, control centre for tanker, 1 to 140 h.p. units. (Watford Elec. and Manfg.)

* Mr Craven is a director of Watford Electric and Manufacturing Ltd. The article is based on a lecture given at the Royal Technical College, Glasgow, in a series on alternating current for marine auxiliaries.

Although this practice may seem lavish, it is obvious that thermal and electromagnetic effects of fault current on the busbar and connection system in one part of a control centre should not put the whole out of action. It may at first be thought that the control board could be supplied through h.b.c. fuses, and thereby remove the need for such elaboration, but it must be remembered that the shut-down of a complete board, because of a blown fuse, would not be very welcome.

Given soundly built busbars and risers, the next important requirement for draw-out starters is that the withdrawable connection is designed (and manufactured!) to withstand (i) continuous vibration and (ii) the peak current let through by the protecting fuse. Clearly, a short-circuit on the load side of the fuse must not produce contact disturbance and possible arcing and breakdown at the point of connection to the busbar riser. A 300 A h.b.c. fuse would cut off at about 25 kA on a 25 MVA fault, and unless contacts are very good they may very well be blown away from the riser by current constriction and/or electromagnetic forces. The aim is to make sure that any fault is contained within that part of the circuit in which it happens.

The elements of each starter unit, for all draw-out types of construction, are in sequence:

(1) Plugging connection.
(2) H.B.C. fuses.
(3) Isolator (or preferably stalled-current breaking disconnect switch).
(4) Overload relays.
(5) Contactor.
(6) Outgoing plugging connection.

The only difference between this and conventional construction is that in the latter the isolator connects directly to the busbar risers and the h.b.c. fuses follow it.

The direct-on-line (d.o.l.) starter is the one most frequently used and the ony limitation is the size of the motor relative to the generating capacity; or, in other words, the maximum transient voltage dip that can be tolerated in the class of ship concerned determines the maximum size of motor that can be started d.o.l. The behaviour of alternator voltage with impact loading is dealt with by Griffin in an earlier article[1] in this series.

Specification and Selection

We will now deal with the specification and selection of each of the elements in the d.o.l. starter circuit. Throughout, the ambient temperature is taken at 40°C* as specified in Lloyd's Rules and it is assumed that the standard current ratings for the appropriate circuit elements (normally based on BS 775[2] and BS 587[3] for an ambient of 35°C) are reduced by 10% to 20%.

Isolator. The isolator, which has no significant current-breaking capacity, is mechanically interlocked with the starter door or cover and since in emergency it could be called upon to open currents up to eight times full load at a power factor of 0·2 to 0·3, it must be electrically interlocked with the contactor so that the contactor (seemingly) opens before it. Unfortunately, many possibilities, such as a welded contactor, make infallible interlocking impossible. Always there is the very real risk of opening an isolator on load and so starting an arc fault which is destructive to the equipment and dangerous to the operator.

Unquestionably, for shipboard use, on-load isolators (by definition no longer isolators, but disconnect switches) should be specified so that electrical and mechanical interlocking become unnecessary and the motor circuit can be opened with impunity under any condition of load.

Fuses. Fuses provide protection against over-current as distinct from overload. Regardless of the size of the ship, only h.b.c. fuses should be used. Normally, Class AC4 is selected, but in the event of a fault capacity exceeding 25 MVA (only true for the largest passenger ships) Class AC5, which is suitable for 35 MVA, should be specified.

The fuse rating chosen depends on the motor-starting current and accelerating time and is normally two to three times the motor full-load current. Fuse manufacturers provide data on fuse selection for motor starting.

It is important that, in general, each motor starter in the group has its own fuses. It is bad practice to feed several starters through one set of fuses without further protection.

When a complete multi-motor board is supplied through fuses it is necessary to make sure that discrimination between individual starter fuses and the supply fuses is obtained. This is discussed by Jacks[4] very fully, but a rule of thumb ratio of 2:1 for the major to minor fuse is generally acceptable as a minimum.

Overload Protection. Protection of the motor from overheating due to overload is provided either by thermal or electromagnetic relays and it is safe to say that of all the components involved in a.c. motor control gear the overload protection relay presents the most difficult problems.

The arrival of the c.m.r. marine motor to BS 2949[5] which has no rated overload capacity, intensifies the problem, and the rough-and-ready setting of overload relays at $1\frac{1}{4} \times$ f.l.c. is quite unsuitable.

BS 2949 gives a permissible temperature rise for Class A insulation of 90°C for totally enclosed motors. This means that with a relay set to trip at 1·15 × f.l.c., which also happens to have the maximum error of 10% permitted by BS 587 in tripping current, the hottest spot temperature of the winding is about 155°C for an ambient of 45°C. Insulation life is considerably reduced at this temperature: a very rough estimate suggests one-twentieth of its normal life. The need for precise overload relay calibration and clarity and ease in setting is obvious, but it is rarely fulfilled by manufacturers.

Griffin,[1] in an earlier article, suggests that the temperature rises specified by BS 2949 for the sometime ambient of 50°C are too high and it is well to recall that the protection of c.m.r. motors to BS 2613:1957, with what would be lower hottest-spot temperatures (based on an ambient of 40°C), already presents critical and complex problems for effective protection.[6]

The relative merits of thermal and electromagnetic relays have been argued many times but, regardless of the type of relay, the following are essential points:

(1) The current-time curve should follow the motor heating characteristic and should allow reasonable time for motor acceleration without premature tripping.

(2) The available tripping time should decrease with increasing motor temperature (i.e. the relay should differentiate between a cold and hot motor).

(3) The relay should withstand the let-through energy and associated peak current of the h.b.c. fuse with which the circuit is protected.

(4) The relay should be easily set at 1·15 times f.l.c., and clearly calibrated in "amperes to trip" so that the setting can be done unambiguously.

(5) The relay pick-up current should not change during long periods of use, nor should it be upset by a short-circuit on the load side of the relay.

(6) The relay current-time curve should be such that the h.b.c. fuse "takes over" from the contactor at about eight times full load current, so that it is the contactor that deals with all currents within its capacity.

* This temperature is low and the author agrees with Griffin that sustained temperatures of 45°C and even 50°C are not unusual in a ship's engine-room in the tropics.

A typical solenoid relay meeting these requirements is shown in Fig. 3 and the current-time curves for it are in Fig. 5. Typical fuse/relay takeover is shown in Fig. 4.

For many years there has been a serious misunderstanding of the thermal behaviour of a delta connected motor under single-phasing conditions; this matter is dealt with elsewhere,[6] but the fact is that an overload relay set at the essential level of 1·15 times f.l.c. inherently protects the motor from over-heating when running from a single-phase supply.

Contactors. The only special requirement for contactors for marine use is that they operate satisfactorily when inclined at any angle up to 15° transversely and 10° longitudinally and with rolling up to 22½° from the vertical. This usually means that an additional hold-off spring has to be fitted to the normal industrial contactor. Standard industrial contactors are normally quite able to withstand the normal vibration and shock experienced on board ship.

Unlike cargo-winch controller contactors, the contactors used for marine auxiliaries usually have a very light duty, both electrically and mechanically, and apart from reducing the current-carrying capacity by about 10% to 20% to meet the higher ambient temperature, the contactor should simply comply with BS 775. From Clause 53 of this standard the appropriate criteria for marine contactors are:

(i) Current rating as affected by operational duty should be based on the EU rating.
(ii) Mechanical duty. Class II as a minimum.
(iii) Current making and breaking capacity category A4.
(iv) Size of enclosure. Normally assumed to be "small air-volume" (i.e. an enclosure in which the air volume of the enclosing case is less than twice the projected volume of the contactor).

The enclosed uninterrupted rating (EUR) is clearly appropriate for marine use because auxiliaries run without stopping for several days at least and the enclosed standard rating (ESR) for contactors specifies not less than one operation in eight hours. The reason for the inclusion of this condition in BS 775 is that contact operation breaks down the oxide film that progressively forms at the contact interface and so gradually reduces the contact current-carrying capacity. This condition is certainly valid for copper contacts, but it does not hold for silver or silver-cadmium oxide contacts, so for them it is not unusual to make the ESR and EUR values identical.

The mechanical duty is normally light, and a contactor having a Class II duty (i.e. 500,000 operations) is quite satisfactory.

The current making and breaking capacity A4 is unquestionably needed, for the contactor must be able to make and break stalled motor current, repeatedly if need be, and the A4 rating, which specifies making and breaking capacity of eight times f.l.c. up to 150 A and six times f.l.c. above 150 A at rated voltage and 0·2 to 0·3 p.f. is a realistic requirement. Against many industrial applications of contactors, the Lloyd's requirements of a test duty of 5,000 on-load operation is minor.

Perhaps the remaining important requirement, although not specified anywhere, is that the contactor should not "weld" in, and it is unfortunate that silver contacts increase this tendency. Single-break contactors, however, have a very great advantage because their contacts go through a rolling transfer action and so impart a shearing action on any weld which may have formed and if well designed in other respects single-break contactors are far, far less likely to suffer from welding than double-break contactors.

A strong plea must be made that contactor contacts are never "dressed"; they are best left alone unless they are clearly worn or are over-heating.

Short-circuit Performance

The complete starter unit has now been analysed step by step and, in addition to saying that it must comply with the BS 587, consideration should be given to the performance of the complete multi-motor control board under short-circuit conditions. This extension in control-gear testing is a fairly new one in practice, although Knowles[7] first outlined it over 20 years ago.

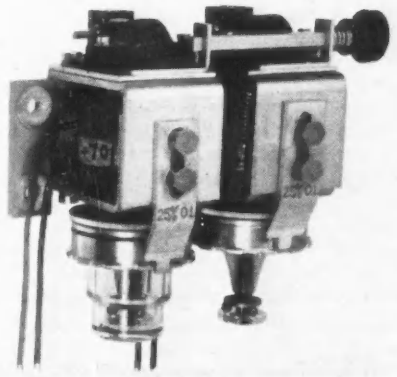


Fig. 3. Precision overload relays with transparent sealed dashpots. (Watford Electric and Manufacturing)

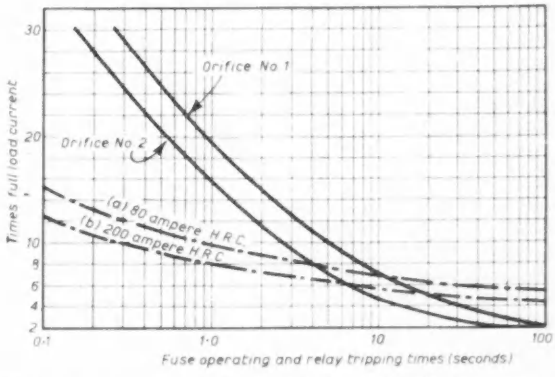


Fig. 4. Fuse operating and relay tripping times, showing crossover points. With 80 amp fuse there are 8 times f.l.c. for orifice No. 2, and 7 times f.l.c. for orifice No. 1. With 20 amp fuse, the respective values are 6·3 and 5·5 times f.l.c.

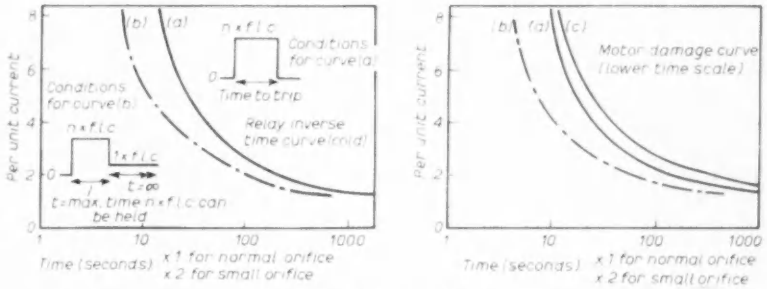

Per unit current
Conditions for curve (b)
n x f.l.c.
1 x f.l.c.
t = max. time n x f.l.c. can be held
t = ∞
Conditions for curve (a)
Time to trip
Relay inverse time curve (cold)
Time (seconds)
x 1 for normal orifice
x 2 for small orifice
Motor damage curve (lower time scale)

Fig. 5. Current-time curves for Watford Electric and Mfg. overload relay shown in Fig. 3

It would be very difficult to discuss the whole technique of short-circuit testing in this article. In outline, a complete board should be type-tested at a short-circuit testing station and evidence held available to show that for each size of starter, with its outgoing terminals connected to form a bolted fault, the starter contactor has been closed against a specified prospective fault, thereby initiating fault current. In this test, the h.b.c. fuses blow, but there should be no evidence of breakdown elsewhere and, apart perhaps from the contactor contacts, the equipment should remain usable.

Vulnerable points are the plug contacts of draw-out type starters, isolator contacts and overload relay heaters or overload relay solenoids. Failure of plug isolator contacts (which, if they are "blown off" under the action of the cut-off current of the fuse, may initiate an arcing fault on the live side of the fuses) would not normally be expected with the h.b.c. fuses of less than 200 A rating. Welding of isolator or plug contacts could be considered to represent a poor performance because access to the starter may become very difficult if it were to happen in practice and the weld was a heavy one.

These type tests should be made on each size of starter and it is obvious that the highest fuse rating combined with the lowest rating contactor and overload relay should be chosen for each size.

In addition to this, it is customary for busbars and connections to be tested at 15, 25 or even 35 MVA prospective fault for 0·2, 1·0 or 3·0 seconds.

Clearly there are degrees of reliability, but it is not unreasonable that motor control-gear for marine use should be among the highest levels, especially where there is little room to move and failure of auxiliaries may hazard the ship. It is interesting to see nowadays how techniques thought only appropriate for switchgear are now considered a necessary feature of motor control-gear by some manufacturers. And quite rightly so; there are many accidents because of the inability of motor control-gear to withstand hazards which arise when connected to high prospective fault current systems.[8]

(To be concluded)

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European Ideas on Consumer Control

ACTION taken by various European countries to form electricity consumers' demands more closely to the pattern most efficient for system operation is described in a recently published study.* Although most countries have some form of two-part tariff as a basic step in this direction, many take more vigorous action to encourage off-peak use and to penalise on-peak demand.

Hungary and Poland are countries where, in the interests of the general national economy, certain heavy industrial consumers are compelled to take electric power at times fitting in with a pre-determined load diagram. In Poland and Roumania special studies are made of individual works to determine the possibility of equalising demand by operating different items of plant at different times. Austrian electricity undertakings make use of load-limiting devices which cut off the current when maximum load is exceeded.

Power Factor

A more sophisticated approach to improving efficient use of power supplies is improvement of power factor. In Hungary, installation of capacitors for this purpose is required under regulations laid down for industrial plant. In other countries, including Greece and Poland, use of electricity at a power factor below a fixed value is penalised by a progressive increase in price per kWh, or even by cutting off the supply. However, Poland has abandoned the practice of reducing price per kWh when power factor was greater than 0·8. It was found that this tariff system encouraged off-compensation which caused voltage rise difficulties at times of low load. In Turkey, improvement in power factor is encouraged by use of kVh motors.

The arrangements by which more effective use of power system facilities is obtained vary widely from country to country. In some countries, such as Hungary, official inspection bodies charged with such improvement have been set up. Advice bureaux of one kind or another are widespread, and the activities of engineering societies exercise a beneficial influence. The UN study lists in some detail the steps taken in the various countries.

Although the report with which this note is principally concerned does not give a great deal of "directory" information about the various organisations involved with promoting efficiency, another recent publication does. This is *Organisation of Electric Power Services in Europe*, which has in it much information about government services, officers of supply undertakings, and bodies conducting research and publicity associated with electricity supply. It is produced by the same UN committee and is obtainable from HMSO, price 5s.

Success

It appears from figures quoted in the study that widespread success has been obtained in the drive to reduce peak demands. Discussing what has been achieved, the study suggests that a stumbling block is often inadequate knowledge of those in charge of industrial undertakings concerning the economics of energy. There might be advantage in organisation of courses of training in such matters.

As we reported last week, the Committee on Electric Power of the UN Economic Commission for Europe has plans for a meeting in Poland in 1962 to consider a symposium of reports on subjects such as those discussed in this present study.

* United Nations Economic Commission for Europe "Rationalisation of Electric Power Consumption," obtainable from HMSO, price 2s 6d.

Light as an actor

25 YEARS OF DEVELOPMENT IN STAGE LIGHTING

IN the complex and fascinating subject of stage lighting there are three broad spheres of approach: control, equipment and utilisation. The first encompasses the highly technical subject of switching, dimming and colour mixing of light from a number of positions at a central station, with or without facilities for "remembering" and setting up patterns of lighting at the touch of a button. The consoles, dimmer banks and even the dimming systems—manual and servo-operated resistance, saturable reactor, thyratron, transistorised, etc.—have already been covered extensively in lectures, papers and technical articles. This is essentially the sphere of control engineering. It terminates at the sockets to which the lanterns and associated lighting devices are connected.

The second deals with the design of the lanterns and light sources for connection to the control system. They come in a variety of shapes, sizes and loadings, each with its own particular function to perform. Their design is by no means haphazard; it calls for all the skill and ingenuity of the illuminating engineer with a knowledge of optics added. It is a special branch of illuminating engineering.

The third is that of utilisation. This is the sphere of the producer who uses the light to achieve his dramatic effects just as he would an actor. To him light is one of the cast. He moves and directs the fittings, each one of which is as personal to him as the actors. He has his own special favourites, likes and dislikes. In recent times the fittings have even been brought out of obscurity behind the proscenium hangings and wings to stand, stark and not always lovely, in full view of the audience.

Three Schools

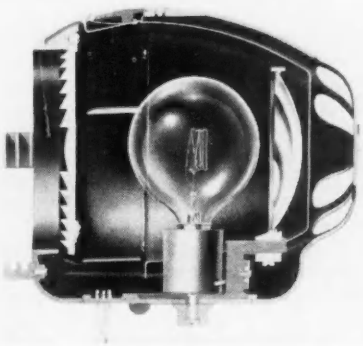
In a paper presented before the Illuminating Engineering Society, London, on 8 August,* Mr F. P. Bentham, F.I.E.S., sets out to describe the developments in lantern equipment which have taken place over the past 25 years. The three principal schools of stage lighting are to be found in Germany—influencing the whole of Europe, including Russia—Britain and the United States. Taking, first, the professional theatre, in Britain and the US the main influence is that of London's West End and New York where theatres are commercial enterprises run for profit and in which, with few exceptions, the control systems are part of the theatre but the fittings are hired by the producers for each show. In Germany, a land with a tradition of civic theatres with resident companies, lighting and equipment is on a lavish scale, even in the post-war rebuilt theatres.

Let us consider the purpose and positioning of the lanterns, the development of which, since the days of gas-jet lighting at the end of the last century, has not been logical but rather as the result of inspiration at war with tradition.

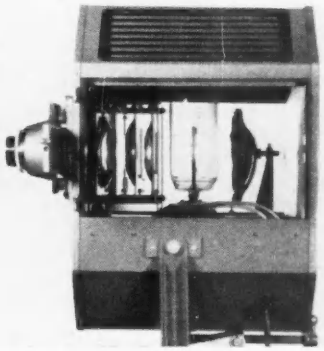
Up to the turn of the century the proscenium stage—essentially an area one aspect of which is viewed by the audience through the proscenium opening—dominated theatre lighting which, once the gas-jets had been supplanted, was mainly from footrows, or "foot lights," at the forward edge of the stage and from battens mounted behind the proscenium arch above the actors. The development of the forestage, projecting beyond the front of the proscenium, was largely responsible for the transference of footrows out into the auditorium, the most convenient position being in the front of the circle.

The emancipation of lighting from the function of mere illumination to its use for dramatic effect came with the introduction of the spotlight, first as the now defunct limelight, later as a carbon arc, and finally as the tungsten filament spotlight. It was at this point that the director started to use lighting for effect; in the musical shows, mainly by the use of colour; in the more serious theatre, for dramatic impact. As he developed his techniques, so did the form and size of the spotlight advance. The ultimate in the use of spotlights is in the progressive stage where, shorn of hangings and surrounds to mask the limits of the acting area, the light itself is used to focus attention, concealing more than it reveals.

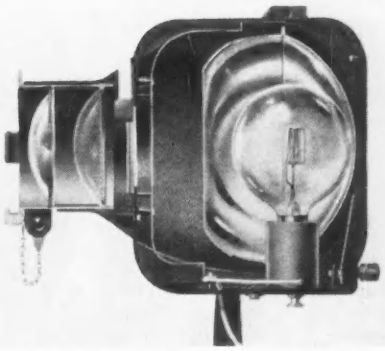
* "Twenty-five years of stage lighting equipment."



Patt. 123 Fresnel spotlight, beam variable between 16° and 45°, shown in part section



Patt. 152 optical projector and effects lantern with 4 kW lamp and heat absorbing glasses



Patt. 23 baby spotlight, also in part section to show position of lamp, reflector and lens

Types of Spotlight

Focus lamps, or spotlights, were in active use before the first world war when the German influence on stage design was high. Early designs were arc-lamps housed in a metal box with a fixed focus lens and runners for colour filters. Focusing was by shifting the arc in relation to the lens, set on a removable slide. This could be taken out to give floodlighting and the usual mounting positions were on the "perch," close to the proscenium in the wings, and, sometimes, from a point high up in the gallery.

Dimming was not, of course, possible with the carbon arc, but a dimming effect was obtained by an iris shutter in front of the lens. The carbon arc soon gave place to the tungsten filament lamp, which considerably simplified matters, the usual size being 1 kW, though 2, 3 and 5 kW lamps were used in Germany for a time to get more light. The higher loadings introduced other problems which were partly solved by the Fresnel spotlight and in the US and Britain, the loading today rarely exceeds 2 kW.

The Fresnel Spot

The Fresnel spot incorporates a moulded "flat-plate" lens and was first imported here from France in the 1930s. It gives narrow-angle beam with a soft edge which can be varied over a small range by moving the lamp in relation to the lens. For the control of spill light from the edge, a "barn-door" attachment is used and mass-produced British Fresnel spots are now available in 250/500 W and 1,000/2,000 W sizes.

Mirror Spots

For true spotlighting, there is a need to have control over the beam shape rather than to rely alone on the magnification of a more or less circular filament. In an attempt to achieve this, a whole series of ellipsoidal reflector spotlights, based on an original design by Kliegl, appeared in the 1930s, resulting in a complete revolution of lighting techniques. These caught on immediately in the US, but took longer to establish in Britain and Germany. Mirror spots, or "profile spots" as they are now more usually called, were obtainable in 1 kW sizes just after the war but the introduction, in 1950, of Class T projector lamps with bi-post caps led to the development of compact, machine-produced mirror spots with a choice of four objective lenses and with 250 W or 500 W lamps. Focusing is by adjustment of the lens tube and/or lamp position in the reflector.

Effects Projectors

Spotlights with attachments for projecting cloud effects on to the cyclorama or background have been in use for many years. These have been developed to meet the needs of theatre and film producers with advancing techniques and ideas, from the back projection in colour of still photographs in place of scenery and dramatic shadow effects to the use of moving films simulating travel of the scene. Some of these equipments are lavish in the extreme, particularly those designed in Germany, and cost up to £1,000. A recent design in Britain based on a 2 kW or 4 kW bulb achieves all the required effects at under one-fifth of the price. For theatrical work, colour backgrounds are projected from slides which have been photographed by a normal colour process from an artist's design. Colour photographs of actual scenes are hardly ever suitable for stage projection since the surrounding scenery is stylised rather than factual. Black and white back projection, both still and moving, of actual scenes are, however, extensively used in films and TV.

Floodlighting

The effect of these spotlight developments on the conventional batten and footrow area lights has also been considerable in recent years. In place of the rows of small lamps in battens over the actors' head, "acting area lanterns" were developed in Germany and introduced here by Basil Dean in 1920. From these, a downward, narrow-angle, 1 kW acting area lantern with a 26° beam reflector was developed in 1935 and, to counter the preponderance of light in any one area of the stage, vertical floodlights, or "pageants," are used in the wings with an increase in the intensity of associated spotlights. The modern technique is to use a number of these lanterns, each covering a section of the stage, supported from bars hanging above the stage and separately controlled. The "pageants" are supported on floor-mounted booms in the wings or by suspended ladders.

In the past the number of different types has been high, one German firm listing as many as 55, but in recent times there has been a tendency towards rationalisation, the kernel of which is eight basic units. This has been to the advantage of the amateur theatre, which often has to plan its productions on small budgets. Today there is a range of fittings at the amateur director's disposal which enables him to emulate the work of the professional at economic cost by renting both lanterns and control boards.

Reactor Pressure Vessels

DESIGN of pressure vessels for nuclear reactors was discussed in a paper presented on Tuesday to the Institution of Civil Engineers. The author is Mr I. Davidson, M.ENG., M.I.C.E., (deputy chief engineer, development and engineering group, UKAEA).

So far as steel pressure vessels are concerned, current designs involve diameters of up to 63 ft, capable of sustaining a pressure of about 300 lb/sq in., with gas at 750°F. In addition, a graphite core weighing upwards of 2,000 tons has to be contained. This requires site fabrication in thicknesses up to $4\frac{3}{8}$ in.

Design of such pressure vessels has to take account of five possible modes of failure.

Tensile failure. There should be little difficulty in preventing this happening under normal operating conditions, unless some deterioration has occurred, which would be a gradual process, giving early warning of impending trouble.

Creep and stress rupture failure. Choice of suitable materials in relation to temperature and irradiation should remove risk of such failures, which in any case would be preceded by warning signs.

Fatigue failure. The number of cycles in the life of the pressure vessel is sufficiently low to make this a problem relatively easy to solve.

Corrosion. Not likely to be serious at temperatures used at present.

Brittle fracture. If this occurred, it would cause instantaneous destruction of the pressure vessel with no previous warning. Use of suitable material together with keeping the pressure vessel above a critical temperature are the precautions adopted. The danger is particularly high before the pressure vessel is stress relieved. The minimum safe temperature rises as the age of the installation increases.

Looking to the future, Mr Davidson notes the possibilities of using prestressed concrete as both pressure vessel and biological shield.

AROUND THE TRADE

BY PEREGRIN

AND so the Fair Trading Council, which has served us for 25 years, is dying—killed by the Monopolies and Restrictive Practices Act. What a pity! I wonder if the architects of this Act could possibly have foreseen the disservice they were doing the electrical trade in general. Surely in their zeal to correct one aspect of trade they have thrown the rest out of balance. Already we have seen the regrettable state reached by the cable trade a few months ago, when it was obvious that if the resultant cut-throat competition continued, not only the quality of the cable, but eventually the workers would suffer. And certainly the shareholders got an undeserved kick in the pants.

One of the troubles is that in this age loyalties count for very little, and "I'm all right Jack" seems to be the prevailing spirit; so that I suspect that there are quite a few people in all sections of the industry who would welcome the free-for-all which could easily follow the demise of the EFTC. There is the manufacturer who goes direct to the public; the wholesaler who serves certain elements at his back door, and the retailer who tries to entice customers from his fellow traders by price-cutting and free gifts. In the long run the public who are paying are badly served, carelessly treated and enjoy neither the goodwill, the sound advice, the after-sales service, nor, in fact, the quality which should be theirs by right. There is a lesson already in the results of departing from normal channels in the closing down of the Domestic Appliance Section of Vactric Ltd. They cut out the dealer and supplied even those who had been faithful to them at full list price only. They should have viewed the success of firms like Hoover Ltd. who realise that every satisfied dealer makes contact with hundreds of potential Hoover customers a week. They should have realised that the direct-to-public door-knocking technique has become suspect these days, and realised further that they needed the dealer more than the dealer needed them.

Hesitant Meeting

It was with pleasure, therefore, that I heard of the meeting of electrical interests, called together by that wise and gallant gentleman Mr T. W. Heather, to endeavour to find an acceptable substitute for the EFTC. Quite a number of associations were represented at this meeting but, from what I hear, many of these associations had already received a caning from the Monopolies Act and had obviously instructed their representatives not to commit them, at least without further consultation. Their unenthusiastic attitude to any ideas put forward and so much apparent caution, hesitancy and dithering left everyone in doubt as to whether to meet again or to communicate direct with Mr Heather the views of their association. One would almost have thought they were a body of criminals, doubtful about the disposal of the swag, rather than representatives of long-standing associations of sane, competent business men anxious to get their products over to the public at a reasonable price, consistent with quality and safety and with a reasonable margin for efficient distribution, demonstration and service.

Why it should be so important for a worker to receive a fair weekly wage, and yet raise objections to an agreement to charge a definite price for an article so as to ensure that all connected with its distribution get a reasonable living, I do not know, but it does seem to me that joint meetings of all sections of the industry would go a long way to fill the gap left by the Fair Trading Council. The Ministry of Works set up committees to evolve a code of practice which did not bother about prices at all but which set down some very useful and practical suggestions for guidance. Perhaps the electrical industry would benefit by a similar idea. It could deal with many things left over from the EFTC, including the vexed question of price maintenance, and I am sure contractor/retailers would be grateful for it over the years. We still have before us the lesson of the gas industry, where by ruthless subsidised competition retailers were practically wiped out—a matter of regret to the gas industry today, I have no doubt.

Area Board Trading

And talking of nationalised industries I must congratulate the Electricity Council and area boards on the way they have set out the "Contracting and Sales of Fittings" accounts. It makes unpleasant reading for the contractors and retailers who must envy the increase on the contracting—nearly £300,000 to the all-high figure of £18,456,851—and the increase in the sales of fittings, etc., by £12½ million. Much of the latter increase is accounted for by an increase in h.p. sales, and one wonders whether such a huge leap in h.p. is good for the country's economy. There really does seem to be some justification for the complaint of retailers of the boards' uneconomic h.p., but, quite apart from that, I am often much impressed by the keenness of their personnel and the efforts to obtain orders, whether for house wiring, factory work or fittings. If the retailer is to continue to hold his own, he must really take advantage of every possible outlet for publicity and service and look to the training of his staff. On this last point, of course, we all await a directive from NECTA's new training expert, Mr Jones.

Incidentally, I notice the boards are down 31% on appliances and 41% on refrigerators over the four months May to August. I can appreciate fully that 41%—it is a sore point with most retailers—and I hear that some of the big nationals are equally badly hit. And yet there are strange anomalies both in sales and in deliveries from manufacturers. The cartoon in *Punch*: "The very latest information on delivery is 3 years 9 months," etc., in respect of the apparently very depressed motor trade just about describes it. Spin dryers and cookers are a case in point. Shining new models are put on the market at a time when the sales are as dead as the dodo, and yet when a customer of mine wants the new Creda spin dryer I cannot get it for love or money.

And just as a final note—I would have thought Pakamac would have had enough to occupy their time just now without going into the electric blanket trade. I suppose soon we may see all the refrigerator firms making umbrellas or gumboots!

OVERSEAS NEWS

from our correspondents abroad

CANADA

Using Coal Resources

As part of a plan to make fuller use of the coal resources of Alberta, it has been proposed that additional steam power stations should be built in that province and their output exported to British Columbia and across Canada to the Maritimes. Under the scheme, Alberta would be called upon to produce 7,140 MW, involving the construction of steam stations which would consume about 4½ million tons of coal annually. Initially, it is suggested, the power transmission lines should run to British Columbia, Manitoba and Ontario. Mr J. G. MacGregor, chairman of the Manitoba Power Commission, seems to be favourably inclined towards the scheme.

More Embargos

Following recent announcements by the Canadian Government of import restrictions on turbo-generator equipment, Canada has insisted on, and the Japanese Government has agreed to, an embargo on sales of radio and television tubes to Canadian importers. The embargo is to remain in effect until the end of the year or until such time as a satisfactory quota has been agreed. Canadian action is aimed at holding Japanese firms to the orderly marketing agreement between the two countries, which allows for a 5% to 10% increase in imports when the market is sufficiently buoyant and not, as was the case last year, complete swamping of the Canadian market to the extent that domestic manufacturing was almost suspended.

Strong criticism of applying quota and tariff protection by the Canadian Government was given recently by Mr S. M. Finlayson, president of Canadian Marconi. He said that industry in Canada could not expect to survive the competition race by trying to erect unreasonably high tariff walls against foreign goods. Although quotas may be necessary in short term, they could not be a long-term solution to the problem of foreign competition. He said the significant difference between Canada and Japan was the incredible will to work of the Japanese which, he thought, arose primarily from a simple concept which had been allowed to drift to the back of Canadian minds that: "If you don't work you don't eat."

150 MW Stator Shipped

The first of four turbine alternator set stators was recently dispatched from the AEI Manchester works. These machines have been ordered by the British Columbia Electric Co. and are to be installed at Burrard power station. The stator weighs 155 tons and, because of inadequate handling facilities at Vancouver, it will be unloaded at the US naval dockyard at Bremerton and then sent by rail to Vancouver.

TURKEY

Light Industries

The Turkish Minister for Reconstruction and Resettlement, Professor Fehmi Yavuz, recently gave some details of plans for developing light industries. The country is to be divided into seven or eight areas and the light industries developed in each area will be those best suited to local economic conditions and requirements. It is hoped in this way to raise the general standard of living of the villagers and they would be further helped by provision of plans and building materials for constructing new homes.

GHANA

Volta Project in Initial Stages

Representatives of 22 companies recently attended meetings with the American consultants, Kaiser Engineers, in Accra to discuss construction of the Volta River project. Consortia formed include Parkinson Howard with Hawker-Siddeley Brush and Taylor Woodrow with the US firm, Morrison-Knudsen. George Wimpey and Richard Costain are also interested. Their competitors include European and United States contractors. Four Ghana-registered firms are also interested in the project, which includes a dam and power house estimated to cost between £60 million and £70 million. It will be recalled that half the cost of the project is being provided by the Ghana Government and the remainder by the World Bank and loans by the British and American Governments.

Contracts for the scheme are expected to be awarded next April. A dam will be constructed at Akosombo, 64 miles north east of Accra, which will create a lake of 3,500 sq miles on land now inhabited by nearly 63,000 people. Construction work on the dam should be completed in 5½ years. The project, estimated to cost in total about £300 million, will supply power for proposed aluminium smelters at Tema.

RHODESIA

Kariba's Third Set

Half-way stage in commissioning at Kariba was reached on 29 Oct. when the third 100 MW hydro set, built by AEI, Rugby, was put on the bars. The commissioning was supervised by the consultants, Messrs Merz and McLellan, on behalf of the Federal Power Board. A further 330 kV substation at Sherwood is also being put into service.

S. AFRICA

Rail Electrification Progress

By July next year, electric locomotives will be hauling trains northwards as far as Leeugamka (formerly known as Fraserburg Rd) on the Cape Town to Johannesburg line of South African railways. Leeugamka is 60 miles from Beaufort West on the 180 mile section for electrification from Touws River. It is reported that, on this section, 80% of the catenary supports are in position and wiring, which has been started from both ends of the line, has been completed over 45 miles.

Buildings for 12 substations and 12 tie stations are completed and equipment installation is in progress. A power line from Worcester is being constructed over the mountains to the first substation north of Touws River. The entire scheme is estimated to cost about £3 million, excluding the cost of the electric locomotives.

Locomotives on the new section of line will be smaller than those running between Cape Town and Touws River and so far 55 locomotives have been ordered from Britain.

PAKISTAN

Power Resources Survey

The Government of Pakistan is shortly to undertake an extensive survey of water and power resources. The survey will cover recording of temperature, rainfall, water flow and soil formation and data which can be utilised for estimating

the magnitude of waterlogging and salinity problems. The scheme in West Pakistan will cost about Rs18,60,00,000 and will be spread over a few years. In East Pakistan, the investigation of water and power resources will cost about Rs5,85,00,000 and will be entrusted to the East Pakistan WAPDA.

Hunza Hydro Plan

The Aga Khan is reported to be considering participation in the Pakistan Government's scheme for hydro power in Hunza under their second Five-Year Plan. The plan proposes a 450 kW hydro-electric plant at Hasanabad. Cost of the plant is estimated at Rs7 lakh. It would supply villages in the area, which is located in the Karakoram mountain range.

INDIA

Rihand Dam

Installed capacity of the Rihand project will be 250 MW with a firm generating capacity of 105 MW. The dam across the River Rihand in Uttar Pradesh is expected to be completed in 1961 at a cost of Rs46·05 crores. The dam will be 3,065 ft long, about 300 ft high and will create a reservoir with a storage capacity of 8·6 million acre ft and a total spread of 180 sq miles. Power from the project will be used for agricultural, industrial and irrigation use in Uttar Pradesh and Bihar next year. Work on the dam began in 1957 and has included construction of an access road 50 miles long from the railhead at Robertsganj and a bridge over the River Sone.

Management of Heavy Electricals

It is reported that the Government of India have decided to bring under one management Heavy Electricals at Bhopal and also two heavy electrical plants to be constructed during the Third Plan period.

Preliminary reports on the two new factories are being prepared by Czech and Soviet engineers and are expected to be ready by the end of this year. Both factories will employ between 15,000 and 20,000 people and, while technicians will be trained in India, engineers and supervisors are to be sent to Prague and Moscow for training. The two plants are scheduled to go into production at the end of 1963 and the beginning of 1964 and will cost about £82·5 million.

The Bhopal unit of Heavy Electricals was inaugurated by the Prime Minister on 6 Nov. This plant, for which the consultants were AEI Ltd., is already manufacturing switchgear and transformers. It is intended that, by 1962, the factory will be building traction equipment for the Chittaranjan electric locomotives.

The first phase of the project has cost Rs21 crores and is designed to produce Rs12·5 crores worth of equipment annually. The second phase of the plant will produce hydro-electric generators and turbines, and has been sanctioned at a cost of Rs26 crores.

AUSTRALIA

Sydney Sales Increase

A 10.8% increase in sales, to a total of 2,664 million kWh, is reported by the Sydney County Council for the year ending 31 Dec., 1959, compared with the corresponding figures for 1958. Although capital income rose by 8%, compared with 1958, to £28·3 million, a deficit of £542,000 was recorded on the year's trading operations. The deficit is attributed to tariff reductions, which became effective on 1 June, 1959, and also to higher cost of electricity purchased. Average price of electricity sold/unit was 2·548d, compared with 2·7d in 1958. Units purchased from the Electricity Commission of NSW amounted to 2,864 million kWh at a cost of 1·619d/unit compared with 1·725d in 1958.

During the year, 11 zone substations with an aggregate installed capacity of 271 MVA were transferred to the Council from the Electricity Commission of NSW. Investigations continued during the year on rating of underground substations in the city area and these have already shown that increase in power output could be obtained with minor alterations to ventilation. An attempt is being made to develop a computer programme for determining rating of the Council's 33 kV cable system. Investigations continued on long-term arrangements for power supply in the inner metropolitan area and these include provision of a new 132/33 kV supply station at Willoughby before 1964 to provide relief for Pyrmont power station. Aggregate of maximum demands in the Council's area rose to 682·4 MVA.

A total of 860 interruptions to supply occurred during the year with an average interruption time of 69 min. 61% of these were due to weather conditions and 21% to defective mains and apparatus.

Snowy Mountains Contract

Tenders for Murray No. 1 power project will be advertised in 1961 according to the eleventh annual report of the Snowy Mountains Hydro-Electricity Authority, for the year ended 30 June, 1960. During the year, the first phase of the Upper Tumut was completed when the second two 80 MW units were brought into service in September, 1959. Peak supplies were made available to NSW system from the Guthega station and from Tumut 1, which also supplied Victoria. These stations supplied 297 million kWh at 1·1d/unit cost of peak load energy. The 60 MW Guthega station continued to operate on a "run-of-the-river" basis and its generators also frequently operated as synchronous condensers to improve voltage conditions on the State system.

Outstanding progress was maintained on the second phase of the Upper Tumut works comprising the Tooma-Tumut diversion, the Tumut 2 project and the Murrumbidgee-Eucumbene diversion. Almost 15 miles of major tunnels were excavated, Tantangara Dam was completed and substantial progress made on the Tooma and Tumut 2 dams. At the end of the year, excavation of the large Tumut 2 underground power station was almost completed. Progress was so rapid that extra funds were required and an additional sum of £2·65 million was made available, bringing the authorities appropriation for the year to £28·25 million. 1959 also saw adoption of the modified arrangement for the Snowy-Murray section. As we reported earlier this year, a surface layout has now been decided upon for the first of the Murray power stations. Development work was carried out during the year on a hollow-core type bolt, said to be easier to install and simpler to grout than previous constructions. Investigations also began on the use of epoxy resins both for concrete repair work and for improving the bond between reinforcing steel and concrete. The investigations have given promising results and epoxy resin was used to carry out repairs to damaged concrete in the Eucumbene-Tumut tunnel.

Hydro-electric Potential

Investigations carried out in recent years by the hydro-electric commission at the Pieman River were recently commented on by Mr Reece, the Premier. He said that the investigation had shown the tremendous potential for hydro-electric development existing on the west coast of Tasmania, where there were four rivers serving an area with an average rainfall of between 80 in. and 100 in./annum. It was possible that development of these resources would revive interest in the west coast mining industries. However, for the next few years, resources available for construction would be concentrated on the Poatina scheme and it would not be until this project was nearing completion that funds could be applied to development of the west coast hydro resources, which was likely to cost about £50 million.

High Consumer Connection

Of the 105,000 people living in the area supplied by the Townsville Regional Electricity Board, 91% are now connected to the supply. Announcing this recently the chairman of the board, Mr J. A. Sherriff, said that more residents would receive electric power before the end of the year. At present, the major extension scheme is to be in the Woodstock, Major's Creek area at £40,000 and in the Don and Gumlu areas. Connecting residents in the Black River and Bluewater Creek districts is also in hand at a cost of £20,000. Land clearing has begun for extensions in the Broughton River area where a number of citrus farmers will be connected.

Personalities *in the industry*

Mr F. R. Mason

Miss P. E. Grady

Mr F. O. Brown

Mr H. Etchells

Mr H. R. Parkin

The export company of Associated Electrical Industries Ltd., AEI Export Ltd., which was formed last year, now has a single managing director instead of three joint managing directors. The change took effect on 1 Nov. Appointed managing director of the company is **Mr F. R. Mason,** B.SC.TECH. **Mr E. V. Small,** who was one of the three joint managing directors, has retired from executive work with the export company and is appointed consultant. **Mr H. West,** M.SC., M.I.MECH.E., M.I.E.E., who is managing director of AEI (Manchester), becomes also a director of the export company; and **Mr B. A. Hensler,** one of the previous joint managing directors, will continue as a director.

Mr D. G. Nairn, O.B.E., is to relinquish his position on the board of J. and F. Stone Lighting and Radio Ltd., following the annual general meeting on 24 Nov. "in order to make room for a younger man and to relieve his own commitments." Mr Nairn has been chairman of the company for 12 years. It is anticipated that **Mr F. Stanley Bassett,** who became a director last April, will succeed him as chairman.

Mr Ernest Long, a member of the Central Electricity Generating Board, is now on a two-week "Meet the People" tour of Ghana and Nigeria as President of the Chartered Institute of Secretaries. He is accompanied by **Mr J. Phillips,** secretary of the Institute.

Morphy-Richards Ltd. are soon to have their own team of demonstrators. As the first step in the implementation of their new policy, **Miss Phyllis E. Grady** has been appointed housecraft adviser/home economist to the company, to assist in the development of new products and in the general promotion of appliances. She will also engage, train and manage a team of lady demonstrators who will promote M-R domestic electrical appliances throughout the country. Miss Grady, who has been associated with the electrical industry for 20 years, was previously senior demonstrator with the London Electricity Board and has close associations with the EAW and EDA. In 1949 she was awarded the Electrical Housecraft Advisers' Diploma, and in 1956 won the Caroline Haslett Travelling Exhibition and toured Sweden for three months, studying domestic electricity. She has also visited the United States, Canada and a number of European countries.

Mr P. B. H. Brown has been elected chairman of Worthington-Simpson following the retirement of **Sir Samuel R. Beale.**

Previously deputy station superintendent at Hams Hall "A," "B" and "C" power stations, Midlands Division, CEGB, **Mr F. O. Brown,** A.M.I.E.E., has now been promoted to station superintendent there in place of the late Mr J. Paxton (*ESH, page 66). Mr Brown started his career in the industry as a trainee at Summer La power station of the City of Birmingham Electric Supply Dept. Later he transferred to Aston power station as a switchboard attendant and then went to Nechells Princes station as a control room engineer. In 1926 he became boiler house shift engineer at the latter station, and three years later was appointed shift charge engineer at the Nechells temporary station, returning to Nechells Princes in 1930 as assistant system control engineer. Mr Brown was transferred to Hams Hall "A" power station in 1946 as combustion engineer, promoted to deputy station superintendent there in 1947, and to station superintendent in 1955. In July last year he became deputy station superintendent of the Hams Hall "A," "B" and "C" stations.

After 52 years in the electrical industry, **Mr H. Etchells,** of AEI Lamp and Lighting Co. Ltd., has retired. He had been Preston area manager until January, 1959, and since then had been acting in an advisory capacity to the company. A native of Manchester, he started his career in the industry in 1909. He had been with BTH and AEI for 37 years. When AEI took over the lamp and lighting departments of the BTH Co., Metropolitan-Vickers and Edison Swan, Mr Etchells was appointed area manager and from there he went to Preston. At a recent ceremony he was presented with an electric fire and an electric blanket from his colleagues.

Mr H. R. Parkin, A.M.I.E.E., has been appointed chief engineer of the Meter Department of English Electric's Meter, Relay and Instrument Division at Stafford. He will be responsible for all engineering aspects of single and polyphase electricity meters and other auxiliary equipment. Mr Parkin received his early training at Measurement Ltd. and joined English Electric in 1937. From 1944 he was a design and development engineer in the Meter Laboratory and in 1955 was appointed chief meter development engineer. He was educated at Stafford County Technical College.

Colonel H. A. Lewis has relinquished his appointment as managing director of EMI Sales and Service to take up the appointment of managing director of Newmark (London) Distributors Ltd.

At the inaugural meeting of the new session of the Royal Society of Arts last week, **Sir Christopher Hinton,** chairman of the CEGB, and **Sir William Holford,** part-time member of the Board, were awarded silver medals for their papers on "Power Production and Transmission in the Countryside: Preserving Amenities." The papers were given to the Society a year ago.

Mr V. H. Devis, formerly N.E. London area representative for Dowding and Mills Ltd., has been promoted to the position of assistant manager of their Southampton branch. **Mr J. Evans** will take over the duties of N.E. London area engineer representative.

Mr D. Wilkie, of Large Electrical Machine Sales, Heavy Plant Division, Rugby, of Associated Electrical Industries Ltd., has retired after over 41 years' service.

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* *Denotes revision to the "Electricity Supply Handbook, 1960."*

Chief accountant of the South Western Electricity Board since 1948, **Mr C. E. Knight,** F.I.M.T.A., F.S.A.A., will, in addition, act as adviser for the Board's Bristol and Somerset group of districts, it is announced (*ESH, page 98). In his capacity as group adviser he will advise senior managers throughout Bristol and Somerset on all aspects of Board policy. A Lancastrian by birth, Mr Knight worked as an accountant for a number of local authorities in the early years of his career. He was appointed deputy borough treasurer of Swindon in 1942 and borough treasurer of Hampstead in 1945.

Mr C. E. Knight

Mr W. H. Devenish

Mr N. J. Winnett

Deputy head of the Member Relations Department of the Electrical Research Association, **Mr W. H. Devenish,** is now on a visit to India. In New Delhi he will attend the plenary meeting of the International Electrotechnical Commission, primarily as the chief British delegate to the technical committee on insulating materials (T.C. 15). As chairman of the Working Group of this committee on Methods of Test for Electric Strength, he proposes to hold a meeting of the Group to consider comments on a draft covering tests on all solid materials. He will also report the corresponding international activity concerning liquids, with which he is also associated. Following the IEC meeting, Mr Devenish will take the opportunity of visiting existing and potential members of the ERA in India. An extensive tour has been arranged which includes Faridabad, Bhopal, Calcutta, Durgapur, Madras, Coimbatore, Mysore, Bangalore, Bombay and Baroda. At Mysore he will address the local centre of the Institution of Engineers (India) on the work of the ERA. He is due to return to England at the beginning of December.

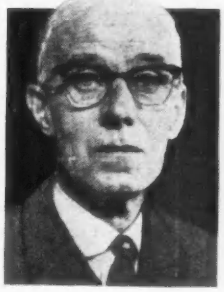
Mr J. J. Pache, A.I.MECH.E., has been appointed station superintendent at Clarence Dock power station, North West, Merseyside and North Wales Region, CEGB. He succeeds **Mr P. H. G. Holbrook,** A.M.I.E.E., who is now station superintendent of the Region's Trawsfynydd nuclear station under construction in North Wales (*ESH, page 74). Mr Pache, who is aged 36, was previously deputy station superintendent at Clarence Dock, after two years at Croydon "A" power station as maintenance superintendent. He entered the electricity supply industry in 1952, gaining experience at Brunswick Wharf and Fulham power stations and in 1955 was appointed boiler house charge engineer at Kirkstall station, Leeds, and in the following year became shift charge engineer at Blackwall Point. Mr Pache studied at Acton Technical College and gained early experience with Rotax Ltd., where he was later engaged on electrical testing and development work on i.c. engine starters and controllers. From 1946 to 1948 he was technical sales engineer, dealing with preparation of specification and inspection of machine tools and diesel engines, and after a further period on planning and co-ordination of manufacture of aero engine equipment was an erection engineer on power station boilers from 1950 to 1951. There followed a short period as assistant production manager with a small engineering firm before he came into electricity supply.

Formerly chief engineer of McLeod and Co., of Calcutta, **Mr A. B. Aston** has been visiting Britain prior to returning to India this autumn as senior electrical and mechanical engineering executive at the Calcutta head office of International Combustion (India) Ltd. He is also to represent South Wales Switchgear Ltd. in India.

Mr Duncan W. Low, B.SC., A.R.T.C., M.I.E.E., A.M.I.C.E., has retired from the position of managing director of Duncan Low Ltd., but is to remain on the board as chairman. One of the pioneers of electric water heating, he made his first heater in 1914 at his father's firm of Archibald Low and Sons Ltd. In 1926 he patented the side-entry circulating immersion heater, still among the most popular types in Scotland. He is succeeded as managing director by **Mr D. R. Lapthorn,** his brother-in-law.

Mr J. J. Pache

Mr Duncan W. Low



Mr D. R. Lapthorn

Manager of the Appliance Design Centre of the GEC at Wembley since April, 1959, **Mr N. J. Winnett,** B.SC., has been appointed manager of the firm's Swinton works, where he has already had considerable experience. Mr Winnett entered the company's Magnet Wks as a trainee in April, 1947. Within a year he was given charge of the Sheathed Wire Element Shop at Magnet Wks and was later transferred to the company's Swinton Wks to manage the hotplate shop. In July, 1948, he was appointed chief inspector at Swinton and, four years later, took charge of design of all technical matters and was given the title of technical manager, a position he held until last year.

Mr N. R. Munro has been appointed sales manager of Duncan, Partners and Price Ltd.

Mr L. H. Coley has been appointed joint managing director with **Mr F. Leighton** of Warbrick (Engineering Specialties) Ltd.

Mr R. R. Kennan, A.M.I.MECH.E., has accepted an invitation to join the board of Ferry-Diamond Engineering Co. Ltd. He will still retain his directorships of Mono Pumps Africa (Pty) Ltd. and Mono Pumps (Australia) Pty Ltd., also the general sales managership of Mono Pumps Ltd., of London.

The Minister of Power has appointed **Sir Hamish D. MacLaren,** K.B.E., C.B., D.F.C., LL.D., B.SC.(ENG.), M.I.E.E., and **Sir Vincent Tewson,** C.B.E., M.C., as part-time members of the London Electricity Board (*ESH, page 75). Sir Hamish only retired at the end of last month from the position of Director of Electrical Engineering, Admiralty, and is currently president of the IEE, while Sir Vincent was until recently general secretary of the Trades Union Congress and has been a member of the Economic Planning Board since 1947.

Nominated as deputy director of the CEGB's Berkeley Nuclear Laboratories is **Dr A. Trevor Churchman,** PH.D., B.SC., M.INST.METALS, M.I.N.E., who joined the Board last year as head of the Materials Division of those laboratories. He retains the latter appointment and also assumes the additional responsibilities of deputy director (*ESH, page 49). Dr Churchman was born and educated in Birmingham at King Edward's School and later at the University. After obtain-

ing his B.Sc. first class Hons. in physical metallurgy in 1946 he went on to obtain his Ph.D. in 1949 and was elected a University Research Fellow the same year. In 1951 Dr Churchman joined the AEI Laboratories at Aldermaston, and from 1955 to 1958 was attached to Professor Cottrell's Irradiation Study Group at AERE, Harwell. In 1957 and 1959, Dr Churchman made lecture tours of the USA, and has had numerous articles published in the scientific journals.

Mr J. Bertram, B.SC., has been appointed manager of the newly formed Systems Department at the Leicester headquarters of AEI Lamp and Lighting Co. Ltd. This department embraces responsibility for the introduction of electro-data processing, development of operational research, organisation methods and service on statistical problems. Mr Bertram graduated from Glasgow University and joined BTH, Rugby, as a student apprentice. He was one of the original members of the Motion Study Society of Gt. Britain, which has now developed and joined with the former Society of Industrial Engineers to form the Institute of Work Study. In 1954 he visited America as a member of the NATO Electronic Team. Since 1958 he has been personal assistant to the director of manufacture.

Mr N. T. Atkinson, formerly head of Ekco television development, has been appointed to the post of chief of television and radio development. Mr Atkinson has been concerned with the development of Ekco television receivers since 1938 and in his new position he will be directly responsible to executive director and chief engineer Mr A. J. Brunker. **Mr E. W. Maynard,** formerly in charge of export television development, succeeds Mr Atkinson as head of television development.

Senior appointments in their Development and Engineering Group are announced by the UK Atomic Energy Authority. **Mr R. V. Moore,** G.C., formerly director of reactor design, and **Dr H. Kronberger,** O.B.E., previously director of research and development, have been appointed as deputy managing directors. **Mr P. T. Fletcher,** C.B.E., B.SC., A.M.I.MECH.E., will be deputy managing director, general management. Mr Moore will be deputy managing director, projects, and Dr Kronberger, deputy managing director, development. **Mr S. Fawcett,** previously deputy director, has succeeded Mr Moore as director of reactor design. In addition, the Research and Development Directorate at Risley has been divided into two executive directorates. **Dr H. K. Hardy** and **Mr F. W. Fenning** have been appointed, respectively, director of fuel element development, and director of reactor technology (*ESH, page 182).

The Saunders Valve Co. Ltd. announce that while remaining a joint managing director with **Mr A. L. Trump, Mr P. T. Stephens** has been appointed deputy chairman. **Mr P. C. E. Rose,** an executive director of the company, has been appointed general manager of the industrial divisions.

Mr G. A. Flume of Carrier International Ltd., returns to America this week after six months in London as technical advisor to Carlyle Air Conditioning and Refrigeration Ltd.

Mr J. Boardman has been appointed chairman and chief executive of the Burtonwood Engineering Co. with effect from 14 November. He was formerly deputy to the present chairman, **Mr R. Dutton Forshaw,** who resigns from the board from that date.

OBITUARY

Mr M. V. Ratcliffe, B.SC.(ENG.), M.I.E.E., M.CONS.E., consultant to Kennedy and Donkin, died recently in an air accident in Brazil while on a temporary mission in connection with a survey his firm are undertaking for the Brazilian Nuclear Energy Commission.

Mr A. V. Hewitt, who died last week aged 64, had been associated with Giffens Ltd. of St. Albans since 1912. Prior to retiring some four years ago, he was the contract supervisor and a director.

Sir Ernest Woodhouse Smith, C.B.E., D.SC., F.R.I.C., F.INST.FUEL, died on 7 November aged 76. He had been associated with the solid fuel and gas industries, and was president of the Institute of Fuel in 1943-45 and president of the Smoke Abatement Society in 1953-54.

To mark the retirement of Mr J. C. Stewart from the managership of the Glasgow and district branch office of George Ellison Ltd., a silver tea service was presented to him by his colleagues on the sales staff. Our picture shows Mr G. J. R. Ellison (right), joint managing director and grandson of the founder of the company, making the presentation

NEW LITERATURE

The Relay Guide

by R. N. Auger

THERE are many manufacturers in Britain who will welcome this compendium in which about 1,000 of the latest designs of relays manufactured in America are illustrated and described. Every day, almost, sees the appearance here of a previously unknown type, either as part of an electrical assembly or as a reference in an overseas specification for which tenders are being prepared. Even as we were perusing its contents we received a telephone message asking if we had heard of a relay bearing the number AH23CN46OAA. We hadn't, but in a few minutes we were able to turn up dimensional details, performance, type, test specifications and maker, all of which were passed on to a vastly relieved inquirer.

It will find a ready place on the bookshelves of electrical component manufacturers and others, particularly in the aircraft industry, but, unlike so many reference books, it will frequently be consulted. There is a need for a companion volume on British relays. Published by Chapman and Hall, 360 pages, 11 in. by 8¼ in. Price 80s.

Photoconductivity of Solids

by R. H. Bube

THE study of photoconductivity can be said to have commenced with the discovery by Willoughby Smith, a telegraph company electrician, that a bar of selenium altered its resistance when exposed to light. This he reported in a contribution to *Nature* in 1873. For the next 50 years little further attention was given to the subject, though in 1879 E. H. Hall noted a potential difference in a material carrying a current, but at right angles to the flow, when in a magnetic field—the now well-known "Hall effect."

Serious study of these and allied phenomena can be said to start with the work of Gudden and Pohl in 1920, Dember in 1931 and others, after which both the field of investigation and the number of researchers expanded rapidly.

The exceptional progress made in another field, that of semiconductor applications, in the 1950's gave added impetus and a number of scientists in universities and industrial laboratories made photoconductivity their specialised study. One of these was Dr Richard H. Bube who joined RCA Laboratories in 1948 and who has concentrated on this work ever since. He now sets down the fruits of his labours in a textbook of exceptional interest and authority. As a comprehensive analysis of photoconductivity effects, it ranks among the more important additions to technological literature. An appendix lists no less than 1,009 references which, in itself, is almost a directory of research workers in this field. Published by Chapman and Hall, 456 pages, 9 in. by 5¾ in. Price 118s.

Potential dividers for field supplies

by a correspondent

THE advantages of potential divider supplies for the field circuits of many machines, especially small experimental ones, are that field control is available over the whole range from zero to the maximum, and that there is no need for any special field discharge resistance: the divider arrangement, Fig. 1 ensures that the field circuit is never broken.

To give smooth control of the field current, the divider is preferably a tubular slider rheostat rather than a stud rheostat with a rotating arm. Unless the maximum field current is under about two amperes, a tubular rheostat to be used as a potential divider supply will have to be graded, i.e., composed of several sections of resistance wire of different current ratings, lest it otherwise need more wire of the maximum rating than can be accommodated on two of the longest tubes available.

The problem of designing such a graded rheostat is discussed in the rest of this article.

Current Flow in Divider

In a smoothly graded potential divider the "through current" I_t, traversing the divider beyond the tapping point, is constant: the load current I_f decreases as the tapping point is moved down from the full-voltage setting, so that the total current I, traversing the divider to the tapping point, also decreases. In theory, the current rating (and hence the cross-section) of the divider resistance wire can thus be continuously reduced from top to bottom; and if this reduction be such that the wire rating is always equal to the total current at the tapping point, the shortest divider wire will be obtained for the given through and maximum load currents. If these currents are equal, the shortest possible wire will be obtained. The wire rating varies smoothly from the sum of the through and load currents at the top to the through current alone at the bottom.

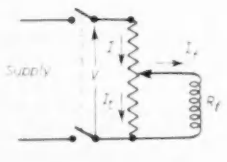


Fig. 1. In a smoothly graded potential divider, current I_t beyond the tapping point is constant. Total current I therefore decreases with field current I_f

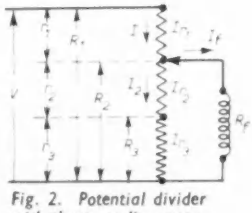


Fig. 2. Potential divider with three grading steps. Step resistances are r_1, r_2 and r_3. Total resistances are R_1, R_2 and R_3

In practice, to use a tubular sliding rheostat of reasonable length as a potential divider, it may have to be graded; and it must then be wound with a number of steps of wire of discrete ratings. The practical problem thus reduces to that of finding the shortest tube possible for given requirements, using a sequence of standard resistance wire ratings. An *ad hoc* procedure for doing this is given.

The criterion is that at the top of each section of wire rating I_r, the sum of the load and through currents, I_f+I_t, is equal to I_r. A three-stage divider in which this condition is met is shown in Fig. 2, in which I_{r1}, I_{r2}, I_{r3}, are the ratings of the steps; R_1, R_2, R_3, the total; and r_1, r_2, r_3, the step, resistances.

R_f is given by $V/I_{f\,max}$.
and R_1 is given by V/I_t.

where I_t is chosen as roughly equal to $I_{f\,max}$.

I_{r1} is $I_t+I_{f\,max}$ so that the top few turns shall be almost fully loaded when the slider is near the top. I_{r2} and I_{r3} are the next smaller available ratings.

R_2 is obtained by remembering that parallel currents are in inverse relation to their resistances.

I_f is $I_{r2}-I_t$, whence

$$R_2=(I_{r2}-I_t)R_f/I_t.$$

Similarly, $R_3=(I_{r3}-I_t)R_f/I_t$.

and similarly for any further available grades, for I_{rn} need be little greater than I_t.

Choosing Divider Size

Total resistances having been obtained as above (tabular computation will save time and space) the steps r_1, r_2, etc., for each rating are found by successive subtraction. From tables, the "ohms per inch" on tubes wound with wire of each rating may be deduced, whence the length of tube occupied by each step found by division; and the total length of tube required found by addition. The accompanying table shows specimen calculations for a 2 A load and 2 A through current.

Specimen Calculation:

V = 200 volts. I_{fmax} = 2·0 amp so R_f = 100 ohms.
I_t = 2·0 amp so R_1 = 100 ohms and I_{r1} = 4·0 amp.

I_r amp.	$I_f = I_r - I_t$ amp.	$R = R_f I_f/I_t$ ohms	r ohms	ohms/in. at I_r	Length occupied in.
4·0	2·0	100	50	3	16·7
3·0	1·0	50	25	6	4·2
2·5	0·5	25	25	8	3·1
			Total length		24·0 in.

This 24 in. tube is rather long. However, it is worth trying to shorten the required length by reducing the through current (and under-running the top section) to enable lower-rating wire, with more ohms per inch, to be used at the bottom. To this end, a trial may be made with I_t at 1·5 A, and a section r_4 of 2·0 A wire of 12 ohm per inch on the tube. The working (not shown) gives a length of 23·9 in., so this trick seems hardly worth it—but be assured that it may be!

Since the writer has not seen anything published on this subject—hence the evolution of the above procedure to satisfy an urgent requirement—he concludes by asking anyone with a more elegant procedure to offer it for publication.

European Power Plant Survey

DESPITE a falling off in demand for boilers and transformers during 1959, the overall position of manufacturers of power plant and equipment in Europe remained exceptionally healthy, new peaks in deliveries of alternators and water turbines more than compensating for the drop in the static equipment. This view is expressed in an OEEC survey published last week. The indication of a reduction in new hydro-electric schemes in Europe, forecast in the previous survey, appears to be confirmed since the flow of new orders was substantially lower than in 1958. Another factor has been the completion of production facilities for boilers in non-OEEC countries, which naturally lowers the demand from member countries. Installations made in non-member countries have, for the first time, exceeded 10,000 t/hr.

Deliveries of steam turbines, alternators, boilers and water turbines, taken together, were up by about 20% on 1958 figures, while alternators for coupling to water turbines not manufactured by member countries rose by 10%. Shipments of transformers fell by 10%. Exports of rotating plant to third countries increased considerably faster than those to member countries.

Deliveries of alternators up to 40 MW remained at about the same level, totalling 2,150 MW as against 2,136 MW in 1958. Alternator deliveries of 40 MW and over rose by 1,830 MW to a new record figure of 9,337 MW, despite delays accounting for as much as 1,791 MW. Orders in hand suggest that a further rise is due in 1960 and shipments of over 11,400 MW are being planned. Total book orders as at 1 January, 1960, amounted to 30,033 MW an increase of 2,274 MW.

Turbines up to 40 MW totalled 2,203 MW but are expected to fall to 1,765 MW in 1960, the lowest figure since 1949. New orders were down 515 MW at 1,688 MW. Against this, the shipments of turbines over 40 MW was up 1,653 MW to a new peak of 8,612 despite a number of late deliveries totalling 1,830 MW. Orders for 1960 indicate that this peak will be passed since deliveries due in the year now total 10,630 MW.

Boilers up to 180 t/hr fell by more than 3,000 t/hr, continuing the drop recorded in previous years since 1952, and a further decline is anticipated. An increase of 8,890 t/hr to 27,818 t/hr in larger boilers was a new peak but shrinking order books tend to show a falling off for future years.

Total installations of nuclear reactors amounted to 155 MWe, 20 MWe above 1958, and a total of 2,247 MWe scheduled for completion in the next four years includes three more reactors totalling 372 MWe.

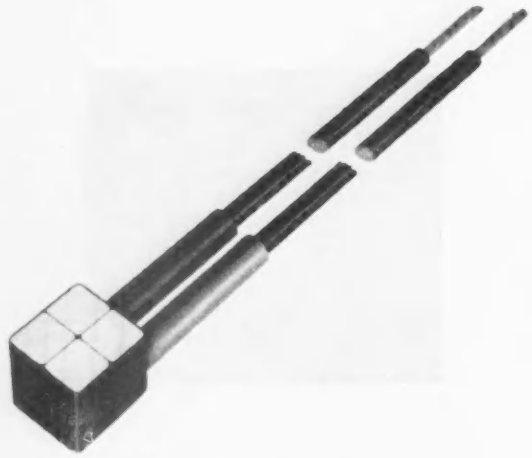
Gas turbine deliveries in 1959 were 69 MW more than estimated at 416 MW with order books indicating a similar programme for 1960. Alternators for use with non-members water turbines reached a new record of 5,323 MW despite arrears at the beginning of the year of 737 MW. New orders are down 1,218 MW at 4,105 MW. Water turbines of 10 MW and over are again a new record at 6,801 MW but order books show the expected drop by 893 MW to 5,908 for 1960, totals having shrunk from 17,022 MW to 14,295 MW.

Though deliveries of power transformers over 5 MVA dropped by 7,888 MVA to 51,427 MVA, orders booked for 1960 were 4,151 MVA up on 1959 figures.

Thermo-electric cooler in production

FIRST of a range of thermo-electric cooling units to be marketed by a British manufacturer has been introduced by Salford Electrical Instruments Ltd. (a subsidiary of GEC) following an extensive research programme at the GEC's Wembley laboratories.

Based on the Peltier effect, the cooling capacities of the units vary from less than 1 W for a single-junction type to more than 10 W for a large multiple junction.



Four-block 1 W Peltier cooling unit for electronic applications

They thus cover a range which cannot be conveniently dealt with by conventional means of refrigeration.

The first of the group to be readily available is the BT.4, a four-junction unit with a cooling capacity rated nominally at 1 W, although the rating can be increased with a resultant reduction in temperature depression. Alternatively, a greater temperature depression can be achieved by reducing the rating.

The BT.4 is made in the shape of a small cube, and thermal junctions are formed by a combination of "p" and "n" types of a bismuth telluride semiconductor material. In use, the block is clamped between the object to be cooled and a heat sink. Typical of its many applications is the cooling of electronic components which must operate in high ambient temperatures, when it serves to increase the power ratings of transistors, reduce the dark current in photo-transistors, or—in the case of quartz crystals—to allow operation at the inversion point or other selected part of the frequency deviation/temperature characteristic.

Other applications are with laboratory equipment such as microtome knives or microscopic slides where local cooling is essential; with instruments such as dew-point hygrometer heads where thermo-electric cooling involves changes in techniques and resultant simplification in the equipment; and with the cooling of small volumes by incorporating one or more units into the walls of a chamber. Here, the temperature may be held constant by a proportional controller which allows smooth regulation of the cooling rate via the d.c. current applied.

PROBLEMS AND PRACTICE

We welcome contributions to this feature; those published will be paid for at our standard rates. There must be many problems encountered in day-to-day electrical work, or useful ideas or tools devised to make it easier; all make instructive reading.

Replacing Bearings

IN the maintenance of machinery, particularly electric motors, it is often necessary to remove ball and roller bearings from the shafts and to replace them by new ones.

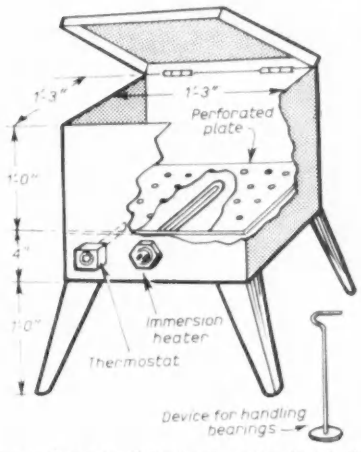
In the majority of cases, by the use of suitable pullers which can be made or bought in a variety of patterns, removal is not a particularly difficult matter. Several of these devices have been described in these pages from time to time.

The replacement of bearings, particularly large ones, is not always possible by purely mechanical methods for most "pullers" are not suitable for pushing. There is always a risk of distorting the inner races where diametrical tolerances are close.

Heating of the bearing is often successful providing that the heat is evenly applied and the temperature is not higher than necessary since all ball and roller bearings must be regarded as precision-made, close tolerance devices. If not much expansion is required, a tungsten filament lamp inserted in the bearing may be effective if rather slow. A better and more rapid method is to completely immerse the bearing in hot mineral oil.

I was horrified to observe, on entering a workshop one morning, a drum containing about ten gallons of light machine oil being heated by a blowlamp for this purpose. Already a blue vapour was arising from the surface and it was clear that no one had considered either the danger of the oil approaching its flash point or the upper limit desirable from the point of view of the bearings.

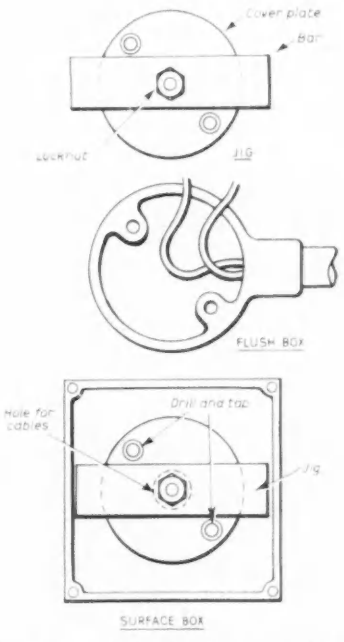
Quickly putting a stop to the practice, we proceeded to contrive an electrically heated and thermostatically controlled oil tank which is depicted here. The heating element and thermostat are of types intended for installation in domestic hot water tanks and were available from stock. This was successful for its purpose and eventually a number were made for other workshops where they proved invaluable, not only because the risk of fire was eliminated, but also because the temperature could be more readily controlled at the desired level. It will be appreciated that, with the thermostat chosen, the oil temperature cannot rise above 100°C but, as a general rule, a lower temperature is adequate for the purpose. The presence of an oil film also facilitates fitting of the bearing.—*F. J. Halligley.*



An easily made oil heater for expanding ball and roller bearings prior to fitting

Jig for a Jack

A SHORT while ago I was engaged on a task which called for the fixing of a number of 3 in. by 3 in. by 2 in. surface boxes, each housing a jack socket, to existing sunk boxes. The normal fixing holes on the sunk boxes to take the cover screws lay, through the positioning of the boxes themselves, at different angles. My problem was to drill the surface boxes to take the fixing screws in such a way that all of them were square with the floor when in position.



The simple jig, shown above, enabled the fixing holes to be drilled correctly in the square surface boxes for attachment to the circular sunk conduit boxes

The first step was to drill a hole in the centre of the square boxes to admit the cables from the sunk box. The position of this hole was readily determined by drawing diagonals across the back of the box. Similarly, the jack socket was fitted in a hole central to the cover of the box. The next step was to prepare a jig for transferring the fixing hole positions in the sunk box accurately to the surface box.

A circular lid was taken and drilled centrally to accommodate a fair sized nut and bolt. To this plate was attached a piece of metal strap, drilled central to take the bolt and with squared-off edges, just wide enough to enter the surface box (see diagram). With the jig in place on the sunk box and the screws inserted in the two fixing holes, the strap was turned to the horizontal (or vertical) position and fixed by tightening the nut. The fixing screws were next removed and the jig transferred to the surface box with the bolt head in the central hole. The fixing holes in the circular plate were then used to drill the surface box which, when finally screwed in place on the sunk box, was square as required. The cable hole was then bushed, the cables fished through and attached to the jack socket connections. The final step was to affix the plate to the box by the corner screws provided.

This simple device, which only took a few minutes to construct, saved a lot of time in marking-off and ensured that all of the boxes were square in position.—*J. H. Robinson.*

'Ware Condensation

THE proposal to prevent the entry of plaster and debris into conduit by corking the tube ends (page 179, 4 Aug.) appears sound enough, but we prefer to get the apprentice to shape circular tapered wood plugs in his spare time and to hammer them in place in a tight fit. This prevents withdrawal by curious fingers.

In either case one should guard against the corroding effects of condensation. The cork or wood plug should be removed some time before the wires are drawn in to allow for free circulation of air.—*"Michet."*

for the electrical trade

Tube diffuser price cuts

PRICE reductions on kW diffuser attachments for use with Super Slim "Popular Pack" fittings are announced by Atlas and Ekco-Ensign. The 8 ft model is reduced from £4 14s 8d to £3 11s, the 5 ft from £2 19s 2d to £2 7s 4d, the 4 ft from £2 10s 11d to £2 2s 7d and the 2 ft from £1 15s 6d to £1 9s 7d. All prices include purchase tax. Effective from 3 Nov. *Atlas Lighting Ltd., Thorn Hse, Upper St. Martin's La, W.C.2; Ekco-Ensign, 45 Essex St, W.C.2.*

Another Pakamac 'fridge

LATEST appliance from the new Pakamac factory is a 2·5 cu ft absorption type refrigerator, "Pelican." It retains several features of the 4 cu ft model which appeared earlier this year, notably the melamine table top and raised panel at the rear, bearing thermostat control and outlet grille. The interior, of blue or lilac polystyrene, includes two sliding shelves, removable egg rack and a large freezing compartment with an attractively styled flap.

The new refrigerator and the 4 cu ft model, which has been available so far only in the north, will both be distributed nationally in 1961. Price of "Pelican," Pakamatic 250, is £46 4s tax paid. Dimensions: 35 in. high by 21 in. wide and 23¾ in. deep. *Pakamac Special Products, Melbourne Mill, Chadderton, Lancs.*

Moffats' oven prices

CONSIDERABLE reductions in prices of built-in ovens by Moffats are announced. Top models now sell at £99 15s instead of £118 and less expensive versions have been reduced proportionately. *Moffats Ltd., 1 Newman St, W.1.*

TRADE PUBLICATIONS

LJUNGSTROM.—Annual report for 1959 and pamphlet describing the development of the Ljungstrom turbine in Sweden from De Laval Ljungstrom (Gt. Britain), 129 Kingsway, W.C.2.

M.K.—Catalogue of electrical accessories for 1961. M.K. Electric Ltd., Shrubbery Rd, Edmonton, N.9.

W. AND G.—1960-61 comprehensive catalogue of electrical accessories, cables and flexibles and price-list. Ward and Goldstone Ltd., Pendleton, Salford 6.

CEILINGS.—Large brochure on ceiling design using luminescent sections and acoustic tiles—components, design and construction. Courtney, Pope (Electrical), Amhurst Park Wks, Tottenham, N.15.

Mercury fluorescent prices

THE announcement of a considerable reduction in the price of "Mazda" 250 W mercury discharge fluorescent lamp follows similar alterations by Philips and Stella which were noted in last week's issue. This lamp, Type MFB/U, is now priced £4 4s list—a cut of 15s. *AEI Lamp and Lighting Co., Melton Rd, Leicester.*

Ceiling fitting becomes wall light

A SIMPLY installed diffuser attachment for use with the Super Slim "Popular" tube fitting turns the unit into an attractive wall light. It is a right-angled section of Perspex which can be fixed over the fitting without any extra screws or accessories. The new attachment, "Pin-up," allows direct downward illumination in the wall mounting position as well as diffused light upward and outward, which should prove ideal in alcoves or over bathroom mirrors. "Pin-up" sells at £1 2s 6d, tax paid, for the 2 ft model and £1 11s 11d, tax paid, for the 4 ft. A cord switch is available with it as an optional extra, 8s. *Atlas Lighting, Thorn Hse, Upper St. Martin's La, W.C.2.*

Night-storage heater

A 3 kW heater has been added to the "Nightstor" range of storage block heaters. Like the earlier models, it is designed to occupy the minimum of floor space, having a false back to enable it to be installed as close as possible to the wall. Finished in hammered bronze, the new "Nightstor" HQ 6330 sells at £22 5s. *General Electric Co., Magnet Hse, Kingsway, W.C.2.*

Dish-washer improvement

A NEW version of the "Dishmaster" dish-washing machine is to be added to Kenwood's range. It differs from the existing models in that it includes an electric water pump and requires no plumbing. The user simply attaches an inlet hose to the water tap and places the end of the drainage pipe in the sink. The new "Dishmaster" needs no exclusive floor space and can be pushed out of sight after use. The pump system is of the centrifugal type, powered by a fan-cooled shaded-pole motor.

One of the earlier models, the Semi-Automatic "Dishmaster," has been modified slightly to include a lid-locking device to prevent the lid being opened whilst the unit is in use. Prices of the machines are Fully Automatic "Dishmaster" with pump, £133 7s tax paid; Semi-Automatic Standard Model, £76 13s tax paid. *Kenwood Manufacturing (Woking) Ltd., Woking, Surrey.*

New spin dryer

A SPIN dryer companion to Brunlec's low-cost "Popular" washing machine is announced at £21. The new dryer, "Twindry," is identical in dimensions to the washing machine and the two can be fitted together to form a tandem unit. It features a transparent plastics lid incorporating the usual safety brake. "Twindry," like the washer, is available in white or cream and can be supplied with a table top at £1 1s extra. *Brunlec Appliances, Junction Mills, Junction St, Burnley.*

▲ *"Pin-up," the attachment that turns a "Super Slim Popular" fitting into a wall-light*

◀ *"Pelican," the second 'fridge from Pakamac. A 2·5 cu ft model selling at £46 4s*

"Twindry" and "Popular," low-cost dryer and washing machine fit together to form a tandem totalling £33 12s tax paid ▶

equipment for industry

Temperature indicator/controller

COMBINING the functions of a remote indication thermometer and a temperature controller, a new addition to the "Bikini" range of instruments will give quick response even when at quite long distances from the point of measurement or control. Temperature indication is by means of a servo-motor driven pointer and the instrument is used in conjunction with a platinum-resistance bulb. Connection is made by an ordinary twin cable lead which can be up to 300 ft long. A choice of 73 temperature ranges is available, from −200°C to 850°C. A separate lead connects the control relay which operates changeover or normally open contacts rated at 10 A. The relay can be arranged to operate at a predetermined temperature by setting a control pointer on the dial of the instrument. Fully transistorised, the instrument reads to 0·5% and can be powered from standard mains supply or 12 V d.c. *Fielden Electronics Ltd., Wythenshawe, Manchester.*

Tropicalised shaded-pole motor

DESIGNED to meet Ministry of Aviation specification DTD 1085/B, a fully tropicalised shaded-pole motor is now available, of which there are two versions. One is continuously rated at 12 W gross with 2 W output, the other at 50 W gross with 12 W output. Full-load speed is 2,700 r.p.m. at 50 c/s and alternative field connections are provided to suit either 230 V or 115 V. Typical applications are cooling blower drives on electronic equipment working under extreme weather conditions and chemical works' mixers in aggressive atmosphere locations. The motor is reasonably priced at 35s. *British Vacuum Cleaner and Engineering Co. Ltd., Goblin Wks, Leatherhead, Surrey.*

Self-drilling anchor-bolt

A SIMPLE but effective means of fixing heavy equipment to masonry or concrete is provided by a self-drilling anchor-bolt used for some years in the USA and now available in this country. Hollow-ended and having specially shaped and hardened cutting teeth, the bolt is first driven into the masonry by hand or pneumatic hammer. It is then withdrawn, a hardened-steel taper-plug inserted in the open end and the combination redriven into the original drilled hole. The end of the bolt is belled out by wedge action and the ridged sides thus solidly embedded in the masonry. It is claimed that tests carried out for medium concrete show that anchorage provided was greater than the sheer resistance of the concrete material. A variety of types can be supplied, such as stud-end, hanger or tie-rod, in sizes ranging from ¼ in. to ¾ in. *F. H. Bourne (Fixings) Ltd., Manor Royal, Crawley, Sussex.*

Illuminated word indicator

DETAILS have been released of an improved version of a unit which displays illuminated code words for giving visual indication of equipment operation. In addition to a selection of seven words such as "stop," "start" and "automatic," a new feature is provision for background illumination in any of five colours. It works on a back-projection principle employing 12 lamps and a system of lenses. The unit has dimensions 3 9/32 in. wide by 5¼ in. high and 11⅛ in. long and is priced £16 10s. *Counting Instruments Ltd., 5 Elstree Way, Boreham Wood, Herts.*

Insulation tester from Japan

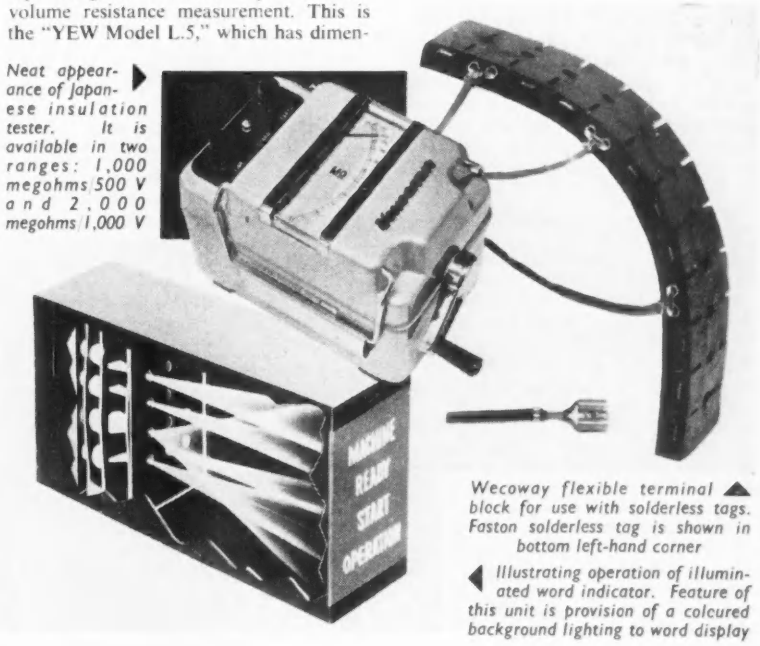
A JAPANESE-PRODUCED insulation tester now available in this country comes in two ranges: up to 1,000 megohms at 500 V and 2,000 megohms at 1,000 V. It incorporates a d.c. output, constant voltage hand-generator and has a dynamometer movement. A separate guard terminal is provided for volume resistance measurement. This is the "YEW Model L.5," which has dimensions 4·2 in. by 4·6 in. by 6·6 in., weighs 5 lb, and is said to be of robust construction. Each instrument is shock and vibration tested and is supplied with a certificate. *The Electrical Instrument Co. (Hillingdon) Ltd., Boswell Sq, Industrial Estate, Glasgow, S.W.2.*

Electro-chemical time indicator

INTENDED for giving indication of operation time lapsed of electrical equipment, an unusual device consists of a cartridge unit containing a replaceable electro-chemical cell. This can be connected across the supply switch terminals of the equipment. Passage of steady current results in anode consumption proportional to time in hours which is marked by the length of the anode on a scale alongside. The cartridge unit is 2⅜ in. long by 1 in. diameter and types available cater for a.c. or d.c. supplies from 6 V to 600 V. This "Selachron" range should find useful application in keeping maintenance and test-run records. *Industrial Instruments Ltd., 9 Paved Court, Richmond, Surrey.*

Solderless tag flexible terminal block

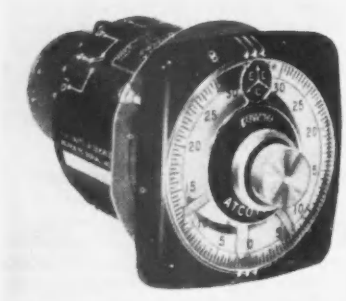
MANUFACTURED specifically for use with conductors terminated by "Faston" (made by Aircraft-Marine Products) solderless tags, the "Wecoway" flexible terminal block is available in 12 ways. The "Faston" tag has parallel twin inserts which are plugged into corresponding tongued sockets in the terminal block. This is said to make a firm, shakeproof electrical contact. If required, the block can be cut to a reduced number of ways. A similar type of terminal block in rigid thermo-setting plastics will soon be on the market. *Metway Electrical Industries Ltd., Metway Wks, Canning St, Brighton 7.*



Neat appearance of Japanese insulation tester. It is available in two ranges: 1,000 megohms 500 V and 2,000 megohms 1,000 V

Wecoway flexible terminal block for use with solderless tags. Faston solderless tag is shown in bottom left-hand corner

Illustrating operation of illuminated word indicator. Feature of this unit is provision of a colcured background lighting to word display



The Atcotrol 306 timer is designed specifically for controlling reversing machinery and process drives. It is one of a series of such devices being manufactured by Everett Edgcumbe

Automatic timing

A SERIES of automatic timers, familiar to the American user, are now being marketed and manufactured in this country by Everett Edgcumbe. The first three of these new timers are now in production. Each has a self-starting synchronous motor and is a miniature component measuring only 3¼ in. square with a single fixing hole.

The "Atcotrol 305" can control up to six load circuits and can be connected for over 100 circuit combinations. It is of the single-duty cycle type with automatic reset and has dial ranges from 15 sec to 60 hr. Two timers can be connected in tandem to give a continuously repeating duty cycle.

The "Atcotrol 304" is a percentage timer designed to control the ON and OFF timers of a single load circuit on a continuously repeating duty cycle. The dial is graduated 0-100% and the 100% basic timing cycle may be 15, 30 or 60 sec. This timer is particularly suitable for applications where electrical heating equipment is in operation.

The third timer, "Atcotrol 306," is essentially two timers in one and controls two independent adjustable load circuits on a continuously repeating duty cycle. A reversing automatic driving motor is incorporated, so arranged as to rotate the elapsed time indicator pointer first in one direction and then in the other between pre-set limit arms. Dial ranges are from 30 sec to 240 min. *Everett Edgcumbe Ltd., Colindale Wks, Colindeep La, Hendon, N.W.9.*

Continental insulation

THE extensive range of insulating products, copper-clad laminates and sleevings made by Messrs Dielektra A-G are now available in this country at prices and deliveries which are said to be competitive.

Among the range of insulation products is "Oleocel," a material claimed to be of particular interest to transformer designers. "Oleocel" cylinders, in contrast to the s.r.b.p. cylinders widely used in transformer construction, are formed from layers of paper which is shellac coated only to the extent of a pattern of discrete dots. This is said to give the important advantage that small channels, so formed in the tube wall, allow oil to soak in during vacuum impregnation and at the same time provide a ready path for removal of volatile matter formed during the curing process. "Oleocel" is available in two grades, one formed from a slightly denser paper. Withstand voltages of 60 kV are claimed over a period of five minutes for an electrode spacing of 1½ in. parallel to the lamina and ¼ in. perpendicular to the lamina when impregnated, and breakdown along the lamina under oil exceeds 75 kV/in. The material is said to undergo practically no dimensional change during impregnation.

Conventional s.r.b.p. is also available in a variety of forms; for example, flat sheets can be produced up to 30 ft by 42 in. Three other recent introductions are melamine paper and fabric and Perlon fabric—a material similar to nylon. Melamine paper has excellent anti-tracking properties, while the fabric, which also has high tensile strength, is readily punchable. The Perlon laminate is a rather more specialised material with high mechanical strength. Resistance to water absorption and fungus growth suits it particularly for tropical equipment. The Dielektra range also includes "feathered" interleaving paper in thicknesses from 1 mil to 10 mils, high quality micanite products and a range of silicone insulating materials. *Engineering and Dielectric Products, 707 Victoria Hse, Southampton Row, W.C.1.*

Simple rust removal

REMOVAL of rust from circulating systems without the need to dismantle them is claimed to be possible by using Pitan Rust Remover. The remover operates by a complexing action said not to attack unrusted metal. It is claimed to be suitable for use in turbine, boiler and engine circulatory systems. Small deposits are removed quickly, but larger rust formations may take some time to disappear. However, since Pitan may be left in the system indefinitely without damage this is claimed to be no disadvantage. *Allweather Paints Ltd., 36 Gt. Queen St, W.C.2.*

Quick inductance measurement

THE inductance and Q-factor of iron-cored inductors can be measured without undue bench preparation by using the Hay bridge manufactured by Furzehill Laboratories. The bridge measures inductance with or without a polarising d.c. flowing and is designed to operate over an unusually wide frequency range from 25 to 3,000 c/s. It has a logarithmic meter, fed from a bridge output through a selective amplifier. This arrangement is claimed to eliminate waveform errors and to give a sharp null indication, ensuring precise and repeatable readings. Inductance is measured on 4 ranges covering 50 mH to 500 H. Calibration of the dial is independent of frequency and accuracy is claimed as ±5%. Two resistive dials reading 25 and 1,000 ohm max. enable the Q-factor to be easily determined. *Furzehill Laboratories Ltd., 57 Clarendon Rd, Watford, Herts.*

Porous bearing material

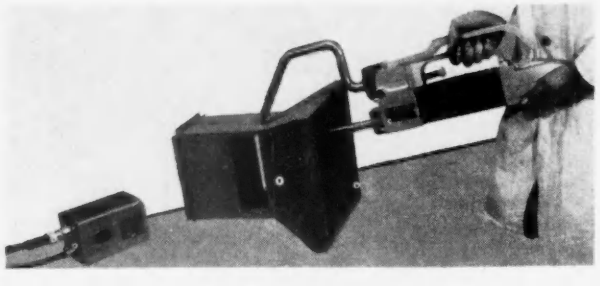
CONTROLLED porosity gives a new nylon bearing material. "Nylasint," the ability to retain substantial quantities of oil for lubrication purposes. The material is intended for bushes, bearing cages and other applications where long, trouble-free life is required. "Nylasint" is formed by cold pressing and sintering crystalline nylon. *Polypenco Ltd., 68 Tewin Rd, Welwyn Garden City, Herts.*

Stable-arc welding electrode

ARC stability coupled with ease of slag control are the two most important features claimed for the "Opal 3½ Ni" arc-welding electrodes. These two features enable d.c. and a.c. supplies to be used with an open circuit voltage down to 70 V. The electrodes are available in five sizes, from 4 to 12 gauge, suitable for currents ratings from 320 A to 90 A. The electrodes are intended for welding low carbon 3½% nickel and similar steels. *Cooper and Turner Ltd., Vulcan Wks, Vulcan Rd, Sheffield 9.*

Lightweight spot-welding gun

FIRST of a number of new lightweight spot-welding guns to be put on the market, the "S.15 Autospot" weighs only 24 lb. It is intended for spot-welding mild, stainless and galvanised steel up to a thickness of 2 by 14 s.w.g. Tip pressures are adjustable up to 550 lb maximum and an electronic timer/contactor is fitted to ensure uniformity in welds produced. Welding arm change is effected easily by loosening a single Allen nut and the gun is supplied with four sets of arms in a special steel case. A class "H" silicon insulated transformer is incorporated, suitable for a 230/250 V 15 A supply. Price, complete with electronic timer, is £88 10s. *Portable Welders Ltd., Castle Mills, Buckingham, Bucks.*



S.15 Autospot lightweight spot-welding gun for fabrication of mild, stainless and galvanised steels up to 2 thickness 14 s.w.g. Weighing 24 lb it is fitted with an electronic timer/contactor to ensure consistent operation

News of the Week

BRITISH EXPORTERS CRITICISED

Lack of sales efforts and attention to markets

OVERSEAS criticism of British products is most serious in respect of design and styling, while exporting firms are criticised for lack of attention to particular markets and lack of sales efforts. That is the experience of Mr R. Maudling, President of the Board of Trade, expressed in a speech during last week's House of Commons debates. Such criticisms, he feels, are too frequent and widespread to be ignored.

Mr Maudling discussed trade at home and overseas in general terms, and on the export subject said his impression was that price and delivery of British firms were competitive all over the world. Quality of British goods was held in high regard; indeed, it was sometimes said to be too high. He warned of a tendency of British firms to think not only that they knew what was best for themselves, but they knew what was best for their customers also. This was a dangerous tendency.

In a brief reference to European trade relations, Mr Maudling said that attempts were still being made to find an acceptable basis for further negotiation between the Six, the Seven and the Commonwealth. Mr Maudling stressed the Government's intention of working in closer co-operation between themselves and private industry to promote overseas trade.

The Government intended to spend more on international fairs and be more active in inviting prominent overseas business men to visit the UK. There was to be a drive to tell British industry about export services the Board of Trade could offer.

Mr Maudling thought the general response to the export campaign that the Prime Minister had launched "had been extremely encouraging."

Another speaker in the debate was Mr Basil de Ferranti. He suggested that there was no longer an optimum size for a manufacturing concern. It was not technically valid to think in such terms; larger firms were able to produce more cheaply than smaller ones. If Britain were to achieve any sort of increase in the rate of productivity and step up exports, it was necessary to have at least one company for each product as big, or preferably bigger, than any of its competitors overseas. However, there were industries like heavy engineering where there were not the same economies of scale that existed in the mass production business. The RTP Act could damage export trade in certain industries where there were no economies of scale, warned Mr de Ferranti.

BELFAST SEEKS LOAN

BELFAST Corporation are proposing to spend £397,500 on the city's electricity distribution system. At last week's monthly meeting, the City Council approved an application to the Ministry of Commerce for sanction to raise a loan for that sum for the purpose.

New Headquarters for S. Scotland Board

PLANS for new £350,000 area headquarters for the South of Scotland Electricity Board, at 130-132 George St, Edinburgh, have been approved by the Edinburgh Dean of Guild. It is proposed that the new building will house accountancy, secretarial, commercial, engineering and consumers' accounts departments at present located in three different offices in the city. A new service centre, to be located on the ground floor, will replace the present centre on the site, and there will be a basement car park. Erection of the new building is to be completed in 1963.

Appliance production eases off

LATEST firm to announce short-time work is Morphy-Richards (Astral) Ltd. Because of the general trade recession and the drop in sales of refrigerators their three Dundee factories are going on to a four-day week from 14 Nov. The Birmingham domestic appliance firm, Parkinson Cowan Appliances Ltd., have given notice to another 80 employees—100 workers were dismissed two months ago.

Rise for plumber jointers

AN increase in pay of 5½d an hour for plumber jointers, both in London and the rest of the country, operative from 20 Nov., has been agreed by the Joint Industrial Council for the Electrical Cable Making Industry. The new hourly rates will thus be 5s 10½d in London, and 5s 7d elsewhere. For plumber jointers' mates the new rates will be 5s and 4s 9d, respectively. There are also consequential increases for learners and others under the agreement.

EXPLOSION AT BOLD "A"

A 30 MW turbo-alternator at Bold "A" power station, North West Merseyside and North Wales Region of the CEGB, exploded last Thursday, causing serious damage, but fortunately no serious injury to the station staff. Just after 9 o'clock in the morning the l.p. rotor on No. 2 machine disintegrated, and the set was completely wrecked, pieces of metal flying in all directions and causing severe damage to No. 1 machine. The accompanying fire was quickly extinguished. No. 4 set was non-operational at the time, undergoing its annual maintenance check. No. 3 machine, which has a water-cooled rotor, was only slightly damaged and is expected to be in service within a few days. Supplies to a large section of south west Lancashire were cut off, but were restored after about ten minutes from an alternative source at the Carlton St grid substation.

WHICH? on Light Bulbs

LIFE and value in electric light bulbs are discussed in the November number of *Which?*, the publication of Consumers' Association Ltd. Nine brands were tested, it being claimed that these represent over 80% of sales in the U.K. But the meaning of all results is reduced by a disclaimer that "what we tested were 240 volt, 60 watt, pearl bulbs only. Assessment of brands is for this voltage, this wattage and for pearl bulbs only."

All bulbs tested were 240 volt, 60 watt pearl (except for one silica-coated type). Tests were made for life, light output and energy consumption. Life tests were extended until 50% of bulbs in a batch had failed; 50 of each brand and type were tested. Lamps were switched off for 15 minutes every eight hours. In these conditions (more stringent than the BS) all except one type reached BS standards. Life to the 50% failure rate ranged from 1,055 hr to 1,630 hr for single coil lamps and from 885 hr to 1,675 hr for coiled coil lamps, excluding "double life" lamps.

Efficiencies for single coil lamps range from 8·2 to 9·7 lumens/watt at 1,250 hr life. The lowest efficiency related to the longest lamp life. For coiled-coil lamps the efficiency measurements were 10·6 to 10·9 lumens/watt.

On value for money, *Which?* points out that various criteria may apply. For example, long life may be important because of difficulty of replacement; or minimum electricity consumption for given output might apply. For economy of use, *Which?* recommends purchase of coiled-coil bulbs, of which Crompton is called "best buy." For long life the "best buy" accolade is given to the Ascot. However, the table on which the economy recommendation is based for some unexplained reason excludes some makes of coiled-coil lamps which, in fact, work as cheap or cheaper on the stated basis, average cost of bulb/1,000 hr plus cost of running to give 600 lumens for 1,000 hr.

Patents and Designs Bill

INTRODUCED last week, the Patents and Designs (Renewals Extensions and Fees) Bill proposes to extend to six months the period of grace for the payment of renewal fees for patents and also for the extension of the period of copyright in registered design. The Bill will also provide a similar period of grace for the making of applications for such extension, to validate certain extensions of the copyright period. In order to allow certain fees chargeable in respect of patents to be increased, the Bill also repeals the proviso to Section 99 of the Patents Act, 1949, and the First Schedule to that Act, which provides for a statutory ceiling on those fees.

Fitting strip lighting to the interior of the Lord Mayor of London's coach in preparation for the procession on 12 Nov. Three 18 in. tubes being installed will improve the view for the public

ELECTRICAL ACCIDENTS

FIVE types of electrical accidents are noticed in the October number of the Ministry of Labour quarterly *Accidents*. One of these stresses an important warning about work on low-voltage accumulators. Although these seem danger-free, if the terminals are shorted out with a conductor—in the accident described, a spanner—and there is a ring on the workman's finger, serious burns can be received. Another burn case arose when an electrician was checking a circuit with make-shift test prods. This incident emphasises the value of test prods with fused, insulated handles.

STUDENTS ABROAD

1,008 STUDENTS of electrical engineering gained a vacation experience abroad during 1960 with the help of the International Association for Exchange of Students for Technical Experience. This is stated in the Association's annual report for that year. 103 of the students were from the UK. Electrical engineering firms in Britain received 178 foreign students for vacation training under the scheme, in which altogether 6,430 students participated, covering a wide range of technologies. The report records that 24 countries are participating in the scheme, ranged as distant as Iceland, South Africa and the USA.

OFFICIAL PUBLICATIONS

Electricity (Amendment) Bill. HMSO. 6d (see page 736).

Patents and Designs (Renewals, Extensions and Fees) Bill. (H.L.). HMSO. 4d (see page 734).

Weights and Measures Bill. (H.L.). HMSO. 5s 6d (see page 708).

Infra-Red Heat for Chick Rearing. Ministry of Agriculture Advisory Leaflet 426. HMSO. 3d.

Thirteenth Survey of Electric Power Equipment. OEEC Report. 10s (see page 728).

NCB Specification 209: 200 A medium-voltage flameproof air-break circuit-breaker. 1s.

Training of Graduates. The Professional Electrical Engineer. Report of Joint Committee. IEE. 2s (see page 737).

REACTORS IN CITIES

LOW-POWERED nuclear reactors, such as those used for experimental purposes, may be built and operated on urban sites, the Minister of Power has decided. In announcing this last week he indicated that he had approved the grant of a licence to install a 10 kW (thermal) nuclear reactor at Queen Mary College, University of London.

In reaching the decision the Minister has had advice from the Nuclear Safety Advisory Committee. They feel that a number of safe designs for small experimental reactors are available. However, the approval is not a blanket one. Factors affecting safety will have to be considered for each individual project, and careful attention will be given to siting. The implication of the Committee's advice to the Minister is that a proposal to erect a reactor should not be ruled out merely because the site is in an urban area. Reactors of the type concerned are normally used in a substantial structure. Detailed operating conditions will apply.

FURNACE CO-OPERATION

THE Hawker-Siddeley Nuclear Power Co. Ltd. and Spembly Ltd. (a member of the Harper Group) have agreed to co-operate in the design, manufacture and selling of specialised high-temperature furnaces. The agreement provides for the joint exploitation of large high-temperature furnaces of a type designed and now being commissioned by Spembly at Hawker-Siddeley Nuclear Power Co. Ltd. works at Langley. The furnaces, stated to be four times larger than anything of their type in the world, are for use in research in the nuclear and high temperature field.

Retail Sales High

RETAIL sales were well maintained in September at a level about 4% higher than a year ago. Sales of appliances and furniture showed a further slight decline, but this was offset by buoyant trading in clothing and footwear, latest figures from the Board of Trade show. Instalment credit sales of household goods showed a seasonal increase of about 10%, but were still 30% below September last year. The overall hire purchase debt continued the downward trend evident in August, falling £8 million to £962 million.

Eire's increased expenditure

THE statutory limit on capital expenditure by the Eire Electricity Supply Board on projects other than rural electrification is being raised from £100 million to £120 million under the Electricity (Supply) (Amendment) Bill, 1959, which was given a second reading in the Dail last week. Under the Bill the limit on capital expenditure on rural electrification is raised from £30m to £32m.

Morgan's New Venture

A NEW company, Morgan-Mintex Ltd., has been formed jointly by the Morgan Crucible Co. Ltd. and British Belting and Asbestos Co. Of the £140,000 authorised capital, Morgan Crucible are providing £100,000 and British Belting the remainder.

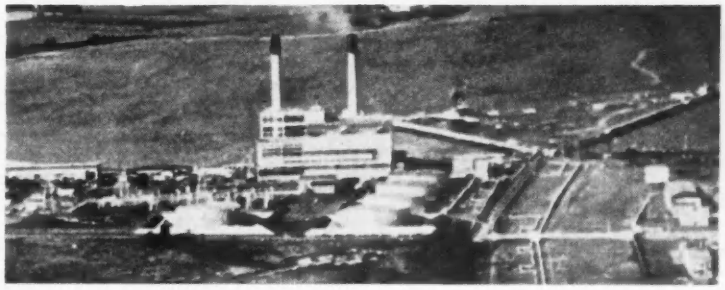
The new concern is to manufacture sintered friction materials, which are to be marketed under the name "Sinterlink" by the Mintex Division of British Belting. The board of Morgan-Mintex will consist of five directors, three nominated by Morgan Crucible and two by British Belting.

Curbing unofficial strikes

THE tougher line by the unions against the trouble-making shop stewards committee in the electricity supply industry is now beginning to take shape. While the national executive of the Amalgamated Engineering Union has asked Mr G. Wake, secretary of that unofficial committee, why he defied a union instruction not to take part in the recent conference at Birmingham, all the five unions concerned are planning joint action to eradicate the trouble.

The latter scheme, apparently, is for a joint declaration that the unofficial shop stewards' movement is an impediment to the official negotiating machinery and should be made redundant by a widening of the communications between unions and members. As part of this plan, it is suggested that district officials should be allowed to attend the meetings of works committees, but this would need an amendment to the NJIC procedure agreement. At present, the constitution does not provide for the attendance of full-time union officials at such meetings. The plan is expected to be finalised very shortly.

COOLKEERAGH STATION OPENED



An aerial view of Coolkeeragh power station on the shores of Lough Foyle, with the tonnage acetylene plant of Carbide Industries Ltd. in the foreground

THE first oil-fired power station in Northern Ireland, Coolkeeragh near Londonderry, was officially opened last week by the Princess Royal. Built for the Electricity Board for Northern Ireland, the station has been in operation since last December when the first 30 MW set was commissioned. A second similar machine is now operating and construction of a 60 MW set is well advanced, to be in service by the winter of 1961. The Ministry of Commerce recently approved a scheme for the addition of a further 60 MW set, and the station can accommodate three more sets of that size.

At the official ceremony, Mr James Walker, chairman of the Board, stated that the units purchased and chartered for use in the Board's area for the nine months to 30 Sept. last showed an increase of over 21%, of which it was estimated 15% was by way of normal growth, the other 6% being attributed to the additional load from the two large industrial undertakings (Du Pont and Carbide Industries) at the Maydown site near Londonderry.

Over £20 million has already been invested at Maydown in these industries. The power station supplies electricity, steam and demineralised water to the adjoining factories.

Consulting engineers for Coolkeeragh power station are Kennedy and Donkin, the associated civil engineering consultants being Sir Alexander Gibb and Partners.

Glasgow's 25 kV Suburban Service

PHASE ONE of British Railways Scottish region's Glasgow suburban service, serving stations north of the Clyde, was inaugurated on 5 November by Sir Brian Robertson, chairman of BTC. Among those present at the ceremony were: The Lord Provost of Glasgow, Mrs Jean Roberts and Sir Robert Inglis, who was responsible for the report strongly recommending the electrification scheme. Sir Brian said that the decision to electrify had only been taken after an exhaustive review of the city's transport requirements. The old steam lines had lost money heavily and popularity of the new system would to some extent determine when the second phase, electrification of the lines in the heavily populated area south of the Clyde, would follow.

Cost of the scheme, which covers 52 route miles, was £16 million. The electrification programme commenced in April, 1956, on the basis of the standardised 25 kV a.c. system, with reduction to 6·25 kV in certain tunnels.

Glasgow Corporation had co-operated by integrating their existing public transport system to key in with the newly electrified lines. Power for the system was derived from the grid and controlled from a single control room at Cathcart. Not only will service frequency be considerably improved, but journey times will be reduced by 20% to 30%.

The coaches are similar to those used on the London suburban electrification schemes. Extensive relaying of track and raising of bridges was necessary and a complete system of colour-light signalling to replace the old semaphore arms had been installed.

L.C.C. Tightens Fire Precautions in Stores

IN view of the recent Liverpool store fire disaster, the London County Council have made a special survey of fire precaution arrangements in 74 large London stores. Among other stipulations, the LCC already requires that all false ceilings shall be of non-combustible material. But the Council has no power to require the provision of fire alarm arrangements, except as a condition of its consent to the erection of the largest buildings. But henceforth the Council's officers propose to review the circumstances of each building inspected and, where necessary, offer advice to the proprietors on alarm systems and other fire precautionary measures.

It is also proposed that planning consents for the erection or reconstruction of stores shall in future include, where appropriate, a condition requiring the provision of suitable fire alarm arrangements.

Down the Slipway

THE Post Office will soon have another cable ship in service—the 4,000 ton *Alert* launched on the Clyde on Monday. Built by Fairfield Shipbuilding and Engineering Co., *Alert* is equipped with diesel-electric propulsion machinery and auxiliary generators supplied by AEI Heavy Plant Division.

ONE PLANT, ONE ORDER—

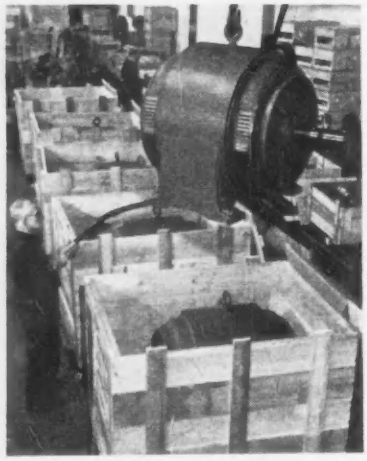
. . . Lord Coleraine at B.E.A.M.A. Conference

BRITAIN might lose export orders worth millions of pounds if the purchaser of a power station, or other huge project, continued to have to chase around among half a dozen firms for various components, Lord Coleraine said last week. In Germany and Japan the customer could take his order to a single person. An extension of the consortium principle, already evident in the nuclear power field, might be the means of closing the gap, he told the fifth BEAMA publicity conference.

Undoubtedly, the first duty of publicists in the electrical industry was to increase the prosperity of their own firms, Lord Coleraine said, but with the increasing dominance of electricity in daily life, they had another duty—to help minimise mistakes by telling the Government and the people about the problems of the industry. The detrimental effects of erratic purchase tax and hire-purchase legislation on the cost of producing domestic appliances was one thing of which Lord Coleraine felt both Government and public opinion should be made more aware.

Professor W. Taplin, of the London School of Economics, told the conference that he had discovered a distaste for advertising among some advertising managers themselves, when he questioned the executives of 40 firms recently. That was hardly the way to get the best results. He thought the anti-advertising fashion among the public would wane. Mr W. D. McClelland, associate manager of sales promotion for Odhams Press, said market research was an essential tool for the advertising manager, but it should not replace creative imagination. Recent surveys had shown that 70% of families comprising the working class group continued to be the most rapidly expanding market for appliances, particularly for washing machines.

The conference was divided on the question of training tomorrow's industrial publicity managers. Those with technical qualifications considered that a technical background was of primary importance; those without were convinced that it was unnecessary. Members of the panel leading the discussion had technical qualifications, with the exception of the trainee representative. Earlier, opening the conference with a description of the coming "Techtopia," Professor W. H. G. Armytage, of Sheffield University, had stressed the need for technological expertise as well as hinting that it may be necessary to come to terms with science.



Packing 33 100 h.p. drip-proof motors before dispatch from Brook Motors' Huddersfield works to Venezuela. With Class "B" insulation, and rodent proof, they have been supplied to Phillips Petroleum Co.

I.E.E. Liverpool dinner

COLLABORATION between professional engineering institutions is favoured by Sir Hamish MacLaren, president of the IEE; but not amalgamation. Sir Hamish made this clear in a speech at the annual dinner of the Merseyside and North Wales Centre of the IEE on Monday. He said action to publicise what an engineer did was the sort of thing that might be tackled co-operatively. Principal guest at the dinner was Admiral Sir Michael Denny, chairman of Camell Laird, who spoke of the changeover in emphasis from mechanical to electrical engineering in the Royal Navy. Today, the Royal Navy could not exist without miles of cable and numerous switchboards. The changeover had been brought about by the electrical engineer. The toast of "The Guests" was proposed by Mr T. A. P. Colledge.

C.E.G.B. to make Isotopes

POWER for the CEGB to make and sell radio-active isotopes in their nuclear power stations is proposed in the Electricity (Amendment) Bill introduced in the House of Commons last week. The Bill is made necessary because the Electricity Act, 1957, forbids the Board to manufacture anything except what they or an area board may require for research or development, repair or maintenance.

The Bill is a short measure of only two clauses. It is reckoned that it will not involve more than £250,000 in capital expenditure by the CEGB to facilitate production of radio isotopes.

INVESTMENT IN ELECTRICITY SUPPLY

INVESTMENT figures for electricity supply in the British Isles, reported in outline in last week's ELECTRICAL TIMES, are shown in more detail in the accompanying table, which is based on a Government White Paper published last week. Notes on these investment figures published in the White Paper add little to information on forward plans already available in annual reports of the boards concerned.

Outstanding in the figures in England and Wales is the growing proportion of generation expenditure attributable to nuclear power stations. In 1960 (i.e., the year ending 31 March, 1961) almost one-third (£53 million) of the generation expenditure comes under this heading and, in 1961, more than one-third (£58 million). In addition, the CEGB is having to meet the cost of initial charges of nuclear fuel for reactors, estimated at £6·5 million in 1960 and £13·6 million in 1961. Initial charges of fuel and reserve stocks kept at stations are treated as capital plant, while nuclear fuel replacing that "burnt up" is charged to revenue account. Nuclear stations expenditure by S. of S. EB is estimated at £9·7 million in 1960 and £5·5 million in 1961. (Generation figures in table include initial fuel.)

The White Paper is the first of what is promised to be an annual series summarising all public investment programmes. Electricity at £337 million in 1960 is the largest single item in the list out of a total of £1,710 million. In 1961 it accounts for £358 million out of a total of £1,730 million.

The White Paper warns that forward estimates such as these are subject to many uncertainties. Changes in delivery dates and revised forecasts of requirements can produce sizeable changes. This has happened particularly with electricity. Moreover, the White Paper says that once work has begun on a project it is usually uneconomic to attempt either to accelerate or retard it at short notice as an instrument of general economic policy.

Amongst major changes on investment level noted in the White Paper is that of British Transport Commission, for whom the railways expenditure of £160 million in 1960 is to be slashed to £125 million for 1961. This reflects postponement of certain expenditure, including presumably main line electrification, pending outcome of the review.

Electricity Supply Investment Plans in £ million

	1960*				1961*			
	England and Wales	South Scotland	North Scotland	Total	England and Wales	South Scotland	North Scotland	Total
Generation ...	170·0	14·2	7·8	192·0	173·6	11·5	11·7	196·8
Main transmission	33·0	3·0	1·5	37·5	41·0	3·5	1·7	46·2
Distribution ...	95·3	8·8	3·1	107·2	103·4	9·0	2·6	115·0
Total	298·3	26·0	12·4	336·7	318·0	24·0	16·0	358·0

* Year ended March, 1961, and March, 1962, for England and Wales.

I.E.E. Restate Training Requirements

RECOMMENDATIONS for the training of graduate engineers as part of their qualification for corporate membership of the IEE are set out in a revision of *The Training of Graduates*, a report of the Joint Committee on Practical Training in the Electrical Engineering Industry. Most of the publication repeats its predecessor of 1957, with reaffirmation of the belief in a three-point plan of basic workshop training, general mechanical and electrical training and directed objective training. Added is an indication of what the IEE will look for when prospective professional engineers take the newly approved alternative route of training on the job—"training in a staff appointment" as it is called.

Notable in the report is a further shift from earlier ideas of apprenticeships, with emphasis on the importance of providing a course of training with the same pace and challenge as the academic course which the graduate has completed. There is a warning against engineering graduates taking staff appointments which provide little opportunity for training.

The publication is in effect an indication of some recommended ways of fulfilling the requirements of the Training Regulations of the IEE, issued last year, so far as graduate engineers are concerned. It is available from the Secretary, IEE, Savoy Pl, London W.C., price 2s 6d post paid.

A.E.I. Work on Telescope

AEI is making all the electrical equipment for the world's second largest radio-telescope which will go into operation next year at Parkes, 200 miles west of Sydney. Planned by Australia's Commonwealth Scientific and Industrial Research Organisation, the new telescope will supplement the work of its big brother at Jodrell Bank. AEI's cable factory at Lydbrook is making special "lubricated" multicore cables which are housed in a "cable twister" to lessen the mechanical stresses imposed by the telescope's horizontal rotation.

RUSSIA SEEKS MORE TRADE —CHANCE FOR EXPORTS

RUSSIA is willing to double her trade with Britain by entering long-term contracts to supply the UK with iron ore, oil and other minerals in exchange for machine tools and a wide range of engineering goods. Mr Patolichev, Soviet Minister of Foreign Trade, told a delegation from the British Institute of Directors this in Moscow recently. Another point which augers well for the British Trade Fair in Moscow next May is that reaching the right contacts is one of the major difficulties of selling to Russia. The delegation, which included Mr J. B. Scott, a director of Crompton Parkinson, believes that the British business man should get into direct touch with the directors of the Russian factories likely to use their products. Permanent representatives of foreign firms are still not allowed in Russia, but the delegation won from Mr Patolichev the assurance that visits to plants by British representatives would not be precluded. The delegation advocates the setting up of a trade office in Moscow by British business organisations to arrange contacts.

PHYSICS EXHIBITION

RECENTLY amalgamated into a single body, the Institute of Physics and the Physical Society will hold the annual exhibition of scientific instruments and apparatus at Westminster from 16-20 Jan. Lectures on hydrodynamic research, the physics of the oceans, and problems of supersonic speed are included in the programme. Previous exhibitions have been under the auspices of the Physical Society, before the amalgamation.

MORE POWER FOR HULL

Mr D. Bellamy, YEB chairman, with Mr C. H. Hudson, chairman, Haltemprice UDC, at the ceremony

SUPPLIES for Hull and district have been augmented by a 45 MW substation opened recently at Hessle. Known as Hull West 132/22 kV Grid Supply Point, the new substation is fed from the grid through Yorkshire Division's Creykebeck supply point. Transmission is by means of a double-circuit 132 kV overhead line 7¼ miles long. The layout includes two 30 MVA 132/22 kV grid transformers. These are of the outdoor oil-cooled type fitted with oil-circulating pumps and cooling fans automatically started at a pre-determined temperature.

Reactor Communications

COMMUNICATIONS have been improved in the materials testing reactor at Dounreay. A man at one station on the reactor face can now talk simultaneously to each other station of the reactor. Previously known systems are generally of the master and slave type, with the slave station capable of transmitting to the master station only.

Large Contracts Awarded

. . . Petbow Ltd.

have received a contract from the Air Ministry for eight 200 kVA standby mains-failure generating sets for their "Ace High" project. Four stations are each to have two sets which consist of Rolls-Royce eight-cylinder turbo-charged diesel engines coupled to Macfarlane transistorised alternators. The complete sets will be resiliently mounted on "Cushyfoot" mountings bolted onto a concrete foundation.

Remote radiators with electrically controlled fan and louvres will be installed and the generating sets will carry a comprehensive range of alarm systems. Each set is capable of starting and accepting a full load in less than 15 sec, in an ambient temperature of −5°C, should the mains fail.

. . . G.E.C.

is supplying £50,000 worth of equipment to convert from steam to electric drive a winder in Withok gold mine (an Anglo-American Corporation gold mine at Withok on the Rand). Twin 6·6 kV 1,150 h.p. ten-pole a.c. motors will be used to drive the 12 ft by 5 ft double-drum winder.

Wharton Crane & Hoist Co.

will next year install £50,000 worth of overhead cranes in James Booth Aluminium Ltd.'s works at Birmingham. The contract includes a 110 ton, four-motor cage-controlled electric travelling crane, with a change speed gear giving treble hoisting speed for loads up to 37 tons.

Sir Hamish D. MacLaren speaking at the AEI (Rugby) Overseas Association's dinner. On his left are Mr L. Drucquer and (on extreme right) Lord Chandos

Sir Hamish D. MacLaren, IEE president, was guest of honour at the annual dinner of the AEI (Rugby) Overseas Association, at Coventry, when Lord Chandos pointed out that AEI was the first to form a group of companies under one name

BRITISH TRADE FAIRS FOR MEXICO

TO tap the £400 million Mexican market the FBI are to hold two consecutive industrial trade fairs in Mexico City, from September to November, 1961. Announcing this at a recent Press conference, Sir Norman Kipping, director general of FBI, said that accent of the exhibitions would be almost entirely on capital and producer goods; for industry and construction in the case of the first exhibition, agriculture, food processing and public services equipment being features of the second. High on the list of exhibits will be heavy electrical plant, dairy and grain-drying equipment, factory machinery and associated control installations. Also to be shown are plant for refrigeration, dehydration and air-conditioning, and telecommunications apparatus.

In 1959, the US had a 73% share of the Mexican market compared with the UK's 4% and W. Germany's 7%. The Mexican Government were, however, anxious that there should be further competition from European manufacturers. There were, at present, heavy restrictions on consumer goods imports into Mexico. This was because the country's economy was adjusted to maintain full employment for a population growing at the rate of 4·5% a year, by encouragement of local industry.

WALTHAMSTOW SHOW

THE task of enlightening business men about electricity was taken up by the North Eastern District of LEB recently with a conference and exhibition. The 26 industrialists who attended heard Mr A. E. Marchant, manager of the district, stress the contribution of electricity to productivity, and representatives of AEI and the British Lighting Council discuss lighting, heating and motors and control gear.

Sayings OF THE WEEK

"I believe that we are largely misusing our graduates during their training period in industry. Their keen minds should be employed in attempting to find solutions to the endless problems in the fields of design, development, controls, automation, metrology, standardisation and so on." . . . DR W. ABBOTT, on Overseas Graduate Training, at the IEE.

"This is a success story and may rid some people of their prejudices against nationalised railways. For people who do not think, it is better at least to rearrange their prejudices once in a while." . . . LORD PROVOST OF GLASGOW, MRS J. ROBERTS, at inauguration of Glasgow suburban railway service.

"Every hydro board in the world apparently has been subjected to continual attack." . . . MR THOMAS JOHNSTON, former chairman, N of Scotland HE Board, writing in the *Glasgow Herald*.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, November 8

	£ per ton	Weekly change £
COPPER, standard class A (settlement)	225	+4½
" (3 months)	225	+2½
LEAD, refined pig, 99·97% purity (cash)	69½	+⅜
" (3 months)	69⅝	−⅛
TIN, refined, min. 99·75% purity (settlement)	800	+3½
" (3 months)	798	+2
ALUMINIUM, ingots 99·99·5%	186	—
" wire bars (4×4×54")	193½	—
BRASS Strip 63/37	201	+3½
SILVER (Troy oz)	79½d	—
ZINC, virgin, min. 98% purity (cash)	88½	+⅜
" (3 months)	87	+½
RUBBER, per lb		
No. 1, RSS. spot	26½d	−⅛d
c.i.f. basis, ports. Jan.	26½d	—
ARMOURING:		
Galv. Steel Wire (0·104 in.)	66½	—
Mild Steel Tape (0·04 × 1½ in.)	53*	—
NICKEL (home)	600	—
MERCURY (76 lb flask)	70½	—
AMERICAN PRICES:		
Copper, electrolytic (per lb)	30c	—
Lead. (New York)	12c	—

* *Tape Price, now an average, includes varnishing*

PUBLIC WORKS EXHIBITION

OPENING at Olympia on 14 Nov. is the seventeenth Public Works Exhibition. The opening ceremony will be performed by the Rt Hon Henry Brooke, Minister for Housing and Local Government. The exhibition continues until 19 Nov. and is held concurrently with a Congress at which will be presented a series of papers that will include two dealing with water and space heating in flats, and public lighting.

Exhibits range from heavy earth-moving equipment to illuminated road signs. One company is showing a rotary compressor designed for powering from a Land-Rover and there are several new pumps, including versions designed for handling solid materials. Diesel engines are also strongly represented, one well-known manufacturer of petrol engines showing a 4 h.p. four-stroke engine which signals their entry into the diesel field. The trend in road signs is illustrated by the large fluorescent-lit type developed for motorways, and electric road danger lamps are also on view, suitable for use with either mains supply or an engine alternator unit. Two electric displays of interest are welding generators designed for 650 A and 400 A rating with continuous current adjustment and a battery charging a.c. generator with rectified output and transistorised charge regulator.

SERVICE TO INDUSTRY

EVERY aspect of the service and advice available to industrial consumers will be featured in an exhibition to be staged by Manweb at the Board's Industrial Development Centre, Liverpool, from 15 to 25 Nov. In addition to examples of prototypes constructed at the Board's test and development laboratory to deal with specific industrial problems, there will be working exhibits of various apparatus. Two lectures, on: "Factors aiding efficiency" and "Protection and control by MCB's," on the evenings of 17 and 24 Nov., will complete the programme.

Computing system memories

WITH the object of focusing attention on ideas for novel computer memories capable of storing very large amounts of information, the US Navy is organising a symposium to be held in Washington, DC, USA. on 23 to 25 May, 1961. It is planned to present a collection of papers concerning suggested new techniques and attendance is open to all interested technical personnel. Further information is available from Miss Josephine Leno, Code 430a, Office of Naval Research, Washington 25, DC.

News in Brief

The CEGB were hosts last week to a three-man delegation from the Finnish State Power Board.

Annual dinner of the Electrical Wholesalers' Federation will be held at the Dorchester Hotel on 23 March next. The a.g.m. will be held at the Park La Hotel earlier that day.

Derbyshire County Council Highways Committee have approved a scheme for electric-warming cables beneath the road surface in Alfreton Hill, part of the main Derby-Sheffield road.

The J and P Foremen's Association held their fourteenth annual dinner recently.

The Census of Production (1961) (Returns and Exempted Persons) Order, 1960, SI No. 1978, just made, prescribes the matters about which returns may be required by the Board of Trade.

350 members of the Social and Athletic Club from the AEI Willesden Wks attended the annual dance recently.

There was a record attendance at the annual dinner of the ETCTA (Midlands Branch) at Birmingham on 28 Oct.

On the Liverpool St-Sheffield-Southend line, Eastern Region, BR, the existing 1,500 V d.c. system was converted to the new BR standard high voltage a.c. 50 cycles system last weekend.

Company Activities

NOW Throgmorton Street, too, seems to be a bit under the weather. Not even the £11 million rise in Britain's gold and convertible currency reserves for the month of October managed to stem the slackening of interest for Ordinary shares last week. A little surprising this, for the October figures gave us our ninth successive monthly increase in the Reserves and was struck after repaying £30 million to the International Monetary Fund—the last instalment on the £200 million borrowed in 1956—and £5 million to the old European Payments Union. But on the day these figures were announced, down dropped the *Financial Times* index of industrial Ordinary shares 4·9 points to 316·1—the largest fall for a single day since Bank Rate was raised in June. It is true that gold and currency increases of October's size cloak a great deal of the "hot money" that has come into London in search of our extremely high interest rates, but at the same time it should be remembered that October is a period when the seasonal strain on sterling is near its peak.

More disturbing for investors was the speech given by the Governor of the Bank of England in which he declared: "It is very clear that today's situation at home does not justify any change of the lines of credit policy."

Against this background, electrical shares were seen to be wilting and not even the proposed £21 million increase to £358 million in Government spending on electricity for the 1961-62 financial year helped to arrest this downward drift. Thus AEI, after its recent show of strength, came back over the week from 47s 9d to 45s, while GEC shed 1s 3d to 33s 9d English Electric, too, eased back 2s 3d to 33s 3d. Parsons softened 3d to 46s 3d and "twin" Reyrolle sagged 1s 9d to 34s 6d. There was little more activity in the shares of E. K. Cole and Pye on the merger terms after the initial adjustments in the 5s ordinary of E. K. Cole, which were marked down 5s 3d to 22s 3d, but then recovered a mere 1½d to 22s 4½d.

Other dull spots included Hoover 5s "A" shares, 2s 1½d off at 41s, Thorn 5s Ordinary, 2s 7½d lower at 45s 7½d, and Plessey 1s 6d easier at 49s.

One of the very few rises of interest to the electrical market was recorded by J. and F. Stone Lighting and Radio, but even here, despite the chairman's optimism, the gain was limited to 9d, leaving the shares at 26s 4½d. Harper Engineering and Electronics, too, reported last week, and it was somewhat surprising to see their 1s Ordinary shares dip 7½d to 10s 3d in view of the tale chairman Mr Norman Weaver had to tell shareholders. The group net profit after tax is up from £115,801 last time to £645,360 for the year ended 30 June, 1960, and the proposed final dividend of 40% makes the year's total up to 80% against 30% for 1958-59. Both orders and sales are still going up weekly and in the first quarter of the current year profits were running about 20% above the corresponding 1959-60 period.

Mr Weaver also hinted that there are free scrip and "rights" issues coming. This sort of performance, if continued, will take some of the speculative flavour from the shares and with a current yield of 7·8% provides share hunters not only with high income but with the lively possibility of further capital appreciation. —*From our City Correspondent.*

Aerialite Ltd.

Although the group profit, before tax, for the year ended 31 May last is down slightly at £274,902 (*£295,824*), the dividend is maintained at 54%, with a final of 34%. Net profit is £159,542 (*£172,439*).

British Electric Resistance Co. Ltd.

With increased profits for the year ended 31 July last, dividend is also raised to 17½% (against 15% last time) with a final of 12½% on capital as increased by a one-for-five rights issue. The profit figure is £72,179 (*£57,473*) and, after tax, etc., the net profit is £38,779 (*£29,273*). It is also proposed to make a one-for-four scrip issue; and it is the board's intention, in the absence of unforeseen circumstances, to maintain a 17½% dividend on the large capital for the current year.

Crabtree Electrical Industries

Although profit for the year ended 31 July last is slightly down at £206,063 (*£222,752*) after taxation, etc., the dividend is, in effect, increased, with a final of 8¾% making a total of 12½% of the £1,200,000 capital, as against 20% last time on £600,000 capital.

Falk, Stadelmann and Co. Ltd.

With a reduction in the group profit for the year to 31 March last, dividend is cut by 2½% to 7½% with a final of 2½%. Profit is down to £217,271 from the previous year's total of £371,236. After taxation, etc., the net profit is £96,840 (*£189,574*). The chairman, Mr H. Falk, points out that difficulties occurred mainly in the field of electric cable and paraffin oil burning heating appliances, and there was also a sudden and complete cessation of trading in certain important overseas markets for the greater part of the year.

Harper Engineering and Electronics

A final dividend of 40% makes the total 80% for the year ended 30 June last, on the enlarged capital. The group profits, including approximately £55,000 attributable to accounting periods in excess of 12 months, amount to £848,304 (*£166,752*) after charging depreciation at £168,916 (*£46,546*).

Simms Motor and Electronics Corpn.

In addition to a maintained interim dividend of 5% on increased capital, a proposed one-for-ten scrip issue is proposed.

S. Smith and Sons (England) Ltd.

A final dividend of 15½% increases the total distribution by 2½% to 20% for the year ended 30 July last. Group profit for the period rose to £4,190,708 (*£3,603,977*).

J. and F. Stone Lighting and Radio

The improved figures for the past year were largely due to lifting of credit restrictions, but, since these were reimposed this year, credit turnover has slowed down considerably, Mr D. G. Nairn, chairman, tells shareholders. The group has 97 branches—11 shops were acquired during the year—and it is proposed to open more new branches. He also states that the company would not be adverse to acquiring a group of stores should the opportunity present itself, although there is no intention of paying more than the true economic worth. On the other hand it is proposed to spend a substantial sum on expansion and modernisation of a number of existing branches.

Year to 30 June	£ Trading Profit	£ Net Profit	% on Ord.		Ord. Price	
			Earned	Paid	High	Low
1956	1,198,758	449,667	130	50*	16/1	10/4
1957	1,237,780	447,601	65	30	25/3	15/3
1958	860,678	309,188	45	30	27/4	16/6
1959	617,120	280,775	38	30	37/-	26/-
1960	915,802	386,269	53	35	38/9	24/9

* Plus 100% capital bonus.

Strand Electric Holdings

It is already apparent that turnover for the current year will establish another new record, Mr J. D. H. Sheridan reports. The Australian subsidiary provided a substantial contribution to profits in the past year, and it is expected that Canadian activities will do likewise in the current year, although they suffered a loss there last year.

Tube Investments

With trading profits of the subsidiaries for the year ended 31 July last increasing to £24,112,288 (from £16,782,643 in the previous year), dividend is also raised. A final of 9¼% on the increased capital makes the total 20%, as against 18¼% last time. After charging depreciation, taxation, etc., the net profit of the group is £8,100,735 (*£6,458,460*).

Intended Dividends

Broxlea Holdings. Interim 17½% (*same*).

East African Power and Lighting. Interim 4% (*3%*), but increase does not indicate a higher total.

London Electrical and General Trust. Interim 6% (*same*).

Ward and Goldstone. Interim 5%, against the equivalent of 4% last time.

G. and J. Weir Holdings. Interim 6% (*same*).

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

10 Nov.—Derby B.C. Supply of 49 200 W sodium discharge units on 35 ft steel columns for A5111 Raynesway Trunk Rd lighting.—Advertised 27 Oct. issue.

10 Nov.—Suffolk and Ipswich Fire Authority. Electrical work at Colchester Rd Fire Station.—Advertised 27 Oct. issue.

10 Nov.—Sunderland B.C. Electrical installation in sports pavilion, Marley Pots.—See 3 Nov. issue.

11 Nov.—Armadale B.C. (b) Electrical work in erection of 155 houses in 49 blocks on Bevan site, East Main St. Applications to Town Clerk, H. H. K. Clarkson, 4 South St, by above date.

11 Nov.—Horsham U.D.C. Supply and erection of 26 Stanton Group "B" concrete columns and G.E.C. post-top lanterns for Hawkesbourne Rd and Redkiln Way lighting—See 3 Nov. issue.

14 Nov.—Dunbarton C.C. (8) Electrical installation in proposed police station, house and garage at Arrochar. Applications to County Architect, J. Miller, Ferry Rd, Old Kilpatrick, by above date.

14 Nov.—Essex C.C. Supply and erection of 11 35 ft tubular steel columns with 200 W linear sodium lamps at Stump Cross, near Gt. Chesterford. County Surveyor, Highways Dept, Old Court, Chelmsford.

15 Nov.—Beckenham B.C. Re-wiring of 112 houses on Elmers End Hsg estate. Borough Engineer, Town Hall.

15 Nov.—Cumbernauld D.C. Power and lighting installations in three pumphouses, underground cabling to ten motors and exterior lighting for Dunns Wood Sewage Purification Works. Applications to Chief Architect and Planning Officer, Cumbernauld Hse, Cumbernauld, Glasgow, by above date.

15 Nov.—Rayleigh U.D.C. Supply and erection of 14 Group "A" concrete columns and 28 sodium lamps/gear for A127 Southend Arterial Rd lighting.—See 3 Nov. issue.

15 Nov.—Wigston U.D.C. Rewiring, etc., in council offices. Engineer and Surveyor, Bushloe Hse, Wigston, Leics. Deposit £2 2s.

16 Nov.—Dunbarton C.C. (1) Erection and wiring only of 56 fluorescent lighting units in Seafar I area, Cumbernauld New Town; (2) Cabling erection and wiring only of 41 240 W Group "A" fluorescent lighting units for Ring Rd North Side, phase I, at Cumbernauld. Applications to County Lighting Superintendent, W. Arthur, 24 George Sq, Glasgow C.2, by above date.

16 Nov.—Wigan B.C. Electrical installations in 27 dwellings on Drummond Sq site.—See 3 Nov. issue.

17 Nov.—Belfast C.C. Electrical installation in Assembly Hall, Dunkeld Gdns Modern Secondary School for Girls—See 27 Oct. issue.

17 Nov.—Birmingham C.C. Socket-outlet installations and lighting installation repairs in 250 houses at Acock's Green.—See 20 Oct. issue.

17 Nov.—Darfield U.D.C. Rewiring of 118 houses.—See 3 Nov. issue.

17 Nov.—Fylde Water Board. Supply of flow recorder panel and hydraulic measuring equipment.—Advertised 13 Oct. issue.

17 Nov.—Glasgow T.C. Supply of heavy canteen equipment for school kitchens, including: (Item 7) fish fryer; (8) refrigerators; (9) food preparing machine; (10) hot cupboard; (11) potato peeling machine; (12) mixing machine; (13) meat slicer.—See 3 Nov. issue.

17 Nov.—Penybont R.D.C. (b) 140 W sodium lighting on 25 ft columns scheme at Llangynwyd. Engineer and Surveyor, Greenmeadow, Coity Rd, Bridgend. Deposit £2 2s.

18 Nov.—Breconshire C.C. Electrical work at County Surveyor's Depot, Beili Bedw, Sunnybridge. Applications to County Architect, Rhyd Offices, Brecon, by above date.

18 Nov.—Hornchurch U.D.C. Class "A" lighting, Trunk Rd A13; (1) resiting of 30 steel units and erection of 34 steel units; (2) supply of 34 steel columns; (3) supply of 83 lanterns; (4) supply of 83 sets control gear; (5) supply of 83 horizontal 400 W MBF/U lamps.—See 3 Nov. issue.

18 Nov.—Maidstone B.C. Electrical installation in conversion of 107 Tonbridge Rd into an old people's hostel. Borough Engineer, Palace Ave.

18 Nov.—N.I. Housing Trust. Plumbing, electrical and patent tile subcontract in 47 dwellings, Kary Hill, Downpatrick. Trust Offices, 12 Hope St, Belfast 12.

18 Nov.—Old Fletton U.D.C. Improvement to Group "B" standard of 58 street lighting units. Surveyor, Council Offices, Old Fletton, Hunts.

19 Nov.—Flintshire C.C. Compressor for charging B.A. cylinders.—See 3 Nov. issue.

19 Nov.—Halesowen B.C. Supply and erection of 60 Class "A" and 770 Class "B" street lighting units on concrete or steel columns along various roads. Borough Engineer and Surveyor, Council Hse.

21 Nov.—Chertsey U.D.C. Erection of 92 25 ft and 23 15 ft concrete columns plus 2 steel columns and installation of fluorescent, sodium, mercury and tungsten lighting and for dismantling 64 15 ft columns. Engineer and Surveyor, The Orchard, Staines La. Deposit £1 1s.

21 Nov.—Diss U.D.C. Supply and installation of street lighting at Mere St, Diss. Engineer and Surveyor, Council Offices.

21 Nov.—Haverhill U.D.C. Supply of 14 Group "B" 15 ft columns and lanterns suitable for tungsten or 80 W mercury lighting with chokes and control gear. Engineer and Surveyor.

21 Nov.—Morpeth R.D.C. Electrical installations in 18 houses, Mitford.—See 3 Nov. issue.

21 Nov.—Nuneaton B.C. Erection of 126 columns and wiring: 39 85 W and 35 60 W sodium and 52 100 W tungsten lamps. Borough Surveyor, Council Hse. Deposit £2 2s.

21 Nov.—Wednesfield U.D.C. Supply, erection and wiring of 17 Group "A" Stanton 8F columns with mercury lighting and three Group "B" mercury equipments on columns to be supplied by U.D.C. Engineer and Surveyor, T. A. Peacock, 29 Bolton Rd, Wednesfield. Deposit £2 2s.

22 Nov.—Musselburgh B.C. Supply and erection of 66 15 ft and 15 25 ft concrete columns and installation of mercury and sodium lighting in various roads.—See 3 Nov. issue.

24 Nov.—Dublin. Electrical installation in proposed pathological laboratory and mortuary building at Sir Patrick Dun's Hospital.—See 2 Nov. issue.

24 Nov.—Middlesex C.C. Contract Sub. 39. Wiring, lighting and heating of power house at Deephams Sewage Wks, N.9, by contractors with d.c. experience. Contract includes supply of miscellaneous plant and an automatic telephone exchange.—Advertised 3 Nov. issue.

25 Nov.—Caernarvon B.C. Supply and erection of 86 25 ft steel columns, complete with 140 W sodium lighting and supply only of 14 wall brackets with 140 W sodium lighting/control gear/time switches. Borough Engineer and Surveyor, Swyddfa'r Dref, High St.—Advertised in this issue.

25 Nov.—Manchester C.C. Electrical installation in Harpurhey Technical High School for Girls.—See 3 Nov. issue.

25 Nov.—Woodford Green. Applications for inclusion in (No. 4) list of approved electrical contractors to Group Secretary, Claybury Hospital, Woodford Gn, Essex, by above date.

28 Nov.—Aberdeen C.C. Supply of lamps during 1961.—Advertised 3 Nov. issue.

28 Nov.—Lanark C.C. Street lighting equipment for A8, Dewshill: (1) eight 280 W sodium lanterns; (2) 16 leak transformers; (3) 16 capacitors; (4) eight 35 ft columns with 9 ft outreach. Depute County Lighting Engineer, Hamilton.—Advertised in this issue.

28 Nov.—Lisburn. (a) Electrical installation in Wallace High School extension, Antrim Rd. Details from Consulting Engineers McAuslan, Abbott and Ptnrs, 16 Bedford St, Belfast 2. Deposit £3 3s.

30 Nov.—Edinburgh. Electrical engineering maintenance contract for year to 31 Dec., 1961, in hospitals for Royal Victoria and Associated Hospitals' Board of Management. Secretary and Treasurer, A. G. Welstead, City Hospital, Greenbank Drive, Edinburgh 10.

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources, including an index of trade information with over 100,000 entries

A Selection from the 109 queries answered this week

"Celec" dimmers—makers of? T.E.—Curtis Manufacturing Co. Ltd., 26 Paddenswick Rd, Hammersmith, W.6.

"Rubicon" heating elements—makers of? L.E.B.—Controlled Heating Units (London) Ltd., Avenue Rd, Hampton, Middx.

Heat pumps—makers of? E.B.—Heat Pump and Refrigeration Ltd., Landowne La, Charlton, S.E.7; C.S.A. Industries Ltd., Wharf Rd, Warwick; Denco Miller Ltd., Holmer Rd, Hereford; Jonmil Building Developments Ltd., 16 Carlisle St, W.1; S. B. Jackson, 47 Streatham Hse, Streatham Hill, S.W.2.

"Signlite" floodlights incorporating fluorescent tubes—makers of? A.E.I.—Gowshall Ltd., 14 Lamb's Conduit Passage, W.C.1.

"Handy-Andy" hand dryers—makers of? T.E.—Quiz Electrics Ltd., 160 High St, Teddington, Middx.

"Gaylord Hauser" juice extractors—suppliers of? G.E.W.—Life and Beauty Ltd., 5 Avery Row, W.C.1.

ANSWERS WANTED

"Caryseler" sodium lighting fittings—makers of? C.A.M.—

"Vap" battery chargers—makers of? G.E.—

30 Nov.—Tottenham B.C. Supply of (Item 3) lamps for year.—See 27 Oct. issue.

2 Dec.—Braintree and Bocking U.D.C. (1) Erection of 112 Group "B" prestressed concrete columns; (2) supply, erection and wiring of 115 45/60 W sodium lanterns; (3) laying cable ducts; (4) dismantling existing installation; (5) incidental works.—Advertised 3 Nov. issue.

3 Dec.—Cambridgeshire C.C. Supply, erection, wiring and fitting: (1a) nine 35 ft steel columns with 200 W sodium lighting at Caxton Gibbet roundabout (A45 and A14); (1b) eight 35 ft steel columns with 200 W sodium lamps at Four Went Ways roundabout (A11 and A604); (2) five 25 ft steel columns with 3 by 80 W fluorescent lamps at Bury Toll junction near Newmarket (A11 and A45). County Surveyor, Shire Hall, Castle Hill, Cambridge.—Advertised in this issue.

5 Dec.—Chigwell U.D.C. (i) Supply of (a) 21 steel columns and (b) lanterns/lamps; (ii) erection and installation of 21 200 W sodium units for A11 No. 2 lighting scheme. —See 3 Nov. issue.

5 Dec.—Manchester C.C. Supply and installation of outside lighting of existing aeration plant at Davyhulme Sewage Wks.—Advertised 3 Nov. issue.

12 Dec.—Stockport B.C. 2. Electrical installation proposed Welfare Clinic, Longford Rd West, Reddish.—See 3 Nov. issue.

13 Dec.—Kirkcaldy T.C. (b) Electrical work in erection of new hall at Links St.—See 3 Nov. issue.

14 Dec.—Matlock U.D.C. Supply and installation complete of nine sewage pumps at four pumping stations in Darley Vale.—See 6 Oct. issue.

10 Jan.—Dunblane B.C. Supply and erection of seven Group "A" concrete columns lanterns/auxiliary equipment, plus the resiting of six columns along A9. Burgh Surveyor, Burgh Chmbrs.

1 Feb.—Oxford T.C. Supply and erection of two high-lift 3,500 g.p.m. and two low-lift 3,850 g.p.m. pumps complete with motors, switchgear and cabling. City Water Engineer, 65 St. Aldate's.

No date stated.—Queensferry B.C. Electrical work in erection of public lavatories and surveyor's stores and in alterations in High St flatted houses. Details from Surveyors, C. R. Douglas and Co., 1 Douglas St, Dunfermline.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon Hse, Theobalds Rd, W.C.1, quoting reference.*

17 Nov.—Pakistan. One 3 ft by 2 ft by 2 ft 50 kW 1,003°C furnace. Director-General of Supply and Development, Frere Rd, Karachi. B.o.T. (ESB/28534/60).*

18 Nov.—S. Africa. 15 battery operated low elevating platform trucks, battery chargers and batteries for S.A. Railways. Chairman, Tender Board, P.O. Box 7784, Johannesburg. B.o.T. (ESB/28586/60).*

18 Nov.—America. Disconnect switches (four items). Dept. of the Interior, Bureau of Reclamation, C. S. Shisler, Contract-Purchase Unit, Bldg 53, Denver Federal Center, Denver. B.o.T. (ESB/28420/60).*

18 Nov.—America. One five-panel unit control board for Rocky Reach H.E. Project. Public Utility District No. 1 of Chelan County, 327 North Wenatchee Ave, Wenatchee, Washington. B.o.T. (ESB/28476/60).*

21 Nov.—Pakistan. All-aluminium and a.c.s.r. conductor. Executive Engineer, Stores Electricity, Gharat Bldg, Lahore. B.o.T. (ESB/28592/60).*

23 Nov.—Australia. 2·2 kV supervisory switchgear. Secretary, Victorian Railways, Spencer St, Melbourne. B.o.T. (ESB/28173/60).*

23 Nov.—Egypt. Polishing apparatus, ovens and instruments for Suez Refinery. General Petroleum Organisation, 44 Sharia Abdul Moneim, Dokki, Cairo. B.o.T. (ESB/28573/60).*

24 Nov.—Pakistan. One 75 kW diesel-generating set. Deputy Director-General, Industries, Trade and Supply, P.I.D.C. Hse, Motijheel, Dacca. B.o.T. (ESB/28446/60).*

29 Nov.—Australia. 330 kV isolating and earthing switches complete with insulators, operating mechanisms and supporting structures. Commercial Manager and Secretary, E.C. of N.S.W., Box 5257, G.P.O., Sydney. B.o.T. (ESB/28109/60).*

30 Nov.—Rhodesia and Nyasaland. Three 1,000 kVA, two 500 kVA and three 750 kVA transformers. 8,100 ft 0·2 sq in. 3-core 11 kV armoured cable. 7/0·036 250 V, 0·0225 sq in. and 0·06 sq in. 660 V cable. Electricity Dept., Municipality of Umtali, Southern Rhodesia. B.o.T. (ESB/28587/8 and 9/60).*

1 Dec.—Pakistan. 17 items including instruments, arc-welding equipment and transformer. Deputy Director-General, Industries, Trade and Supply, P.I.D.C. Hse, Motijheel, Dacca. B.o.T. (ESB/28447/60).*

7 Dec.—Pakistan. Six items, insulators. Mr F. Rizwi, Purchase Co-ordinating Officer, P. and T. Directorate-General, Block 32, Karachi. B.o.T. (ESB/28532/60).*

7 Dec.—Pakistan. (1) Two 75 kW, (2) four 50 kW and (3) two 40 kW diesel generators, complete with switchgear. Deputy Director-General, Industries, Trade and Supply, P.I.D.C. Hse, Motijheel, Dacca. B.o.T. (ESB/28445/60).*

14 Dec.—Australia. Two 11/66 kV, 1,500 kVA, 3-ph. transformers and two 66/11 kV, 1,000 kVA, 3-ph. stepdown transformers. Secretary, State Electricity Commission, 447 Gregory Terr, Brisbane. B.o.T. (ESB/28150/60).*

15 Dec.—S. Africa. Eight ultrasonic crack, etc., detectors for S.A. Railways. Chairman, Tender Board, P.O. Box 7784, Johannesburg. B.o.T. (ESB/28549/60).*

15 Dec.—S. Africa. Cables and accessories for Athlone Power Station "A" extension. City Electrical Engineer, Strand St, Cape Town. B.o.T. (ESB/28590/60).*

CONTRACTS PLACED

Admiralty. Renewal of cables in Yorkshire, Sturrock Power Installations, Edinburgh.

Bradford C.C. Electrical work on Holme Wood estate, J. Carter and Sons (Bradford) Ltd, £2,017. Recommended.

Bury B.C. Electrical installation in Public Library, Yewsons (Electrical Contracting).

Hale U.D.C. Installation of 210 mercury lighting units, 15 ft concrete columns, Concrete Utilities Ltd.

Hendon B.C. Lighting and heating installation in Edgware Branch Library, Graham and White Ltd, £3,350. Recommended.

Lisburn U.D.C. Supply and erection of improved fluorescent street lighting, A.E.I. Ltd, £4,861.

London C.C. Provision of sewage pumping plant for new pumping station Holland Gdns, Kensington, Gwynnes Pumps Ltd, £11,484.

Manchester Hospital Board. Fire alarm installation at Hope Hospital, Salford, Engineering Services Ltd; £32,783; mains cabling at Calderstones Hospital, Whalley, North Western E.B., £4,646. Recommended.

Romford B.C. Electrical installations in 16 houses and 24 flats at St. Andrews Rd and Queen St, K. J. Bromley, £1,560. Recommended.

South Shields T.C. Electrical work in erection of new Biddick Hall County Infants' School, C. Ramsay and Son, £2,730 15s 6d. Recommended.

TRADE NOTES

Change of address. Philco (Gt. Britain) Ltd, announce that all sales correspondence should now be addressed to 21 Cavendish Pl, W.1. Telephone: Langham 9291.

Eastleigh Contracts Ltd, have moved to 394 Uxbridge Rd, Hatch End, Middlesex. Telephone: Hatch End 6564.

Change of Name. The title of Dowty Nucleonics Ltd., has been changed to Dowty Electrics Ltd.

New telephone No. The telephone no. of the Ministry of Aviation, at Shell Mex Hse, has been changed to Temple Bar 1207.

Transfer. With the progressive transfer to Southend of several electronics departments from the Malmesbury factory of E. K. Cole Ltd, that company has expanded its electric heater products at Malmesbury to where the Heating Design Dept has also moved.

Agents. Elkay Electrical Manufacturing Co Ltd, have appointed Mr V. Mercer of Victor Mercer (Agencies), 45 Castle St, Belfast, as their selling agent in N. Ireland.

Extension. The Glacier Metal Co Ltd, have recently extended their Manchester factory by some 10,000 sq ft. and equipped it with a number of special purpose heavy machines to undertake the repair and manufacture of an increased range and volume of large white-metal plain bearings.

Tape Recorders. A new company—Moodmaster (Gt. Britain) Ltd.—has been formed following the signing of an agreement between the Conley Electronics Corpn., of Chicago and GBC Electronic Industries Ltd, the British company marketing Clarion transistorised tape recorders in the UK. Moodmaster (Gt. Britain) Ltd, in which GBC and Elizabethan (Tape Recorders) Ltd hold the controlling interest, has been set up to handle the Conley Corporation's Moodmaster continuous background music system in this country. The firm is to open showrooms in Belgravia, but meanwhile inquiries are being dealt with at 32 Portland Pl, London W.1.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Acme. 791,775. Class 9. Vacuum cleaners. Acme Domestic Equipment Ltd, 97 David St, Glasgow S.E.

Hyperfil and **Hyperlam.** B803,097/8. Class 17. Resin-impregnated glass fibre fabrics, etc. **Hyperseal** and **Hypertape.** B803,099/100. Class 17. Insulating tapes, etc. Insulated Sleevings and Tapes Ltd., Electron Wks, Brook St, Preston, Lancs.

I.R.C. 781,403. Class 9. Electric resistances. International Resistance Co., 401 North Broad St, Philadelphia 8, Penn., U.S.A.

Kestrel. 802,038. Class 9. Electrical apparatus and instruments, etc. 802,039. Class 11. Lamp holders, lighting fittings and electric radiators, etc. Kestrel Engineering Co. Ltd., 222 Soho Hill, Handsworth, Birmingham 19.

Lepad. 806,241. Class 9. Connections for coils. Lepads, 13 Dalton Ave, St. Helen Auckland, Bishop Auckland.

Lustrand. 805,757. Class 9. Microphones. Lustraphone Ltd., St. George's Wks, Regent's Pk Rd, N.W.1.

Minx and Nymph, 802,017 and 8. Class 7. Dish-washing machines. Commodore Eng. Ltd., 2a Station Rd, Manor Pk, E.12.

Neptune. 805,522. Class 12. Horns, hooters, etc. Clear Hooters Ltd., Bedworth, Nuneaton, Warwicks.

Suppressovin. 803,916. Class 9. Insulated cables and wire; resistance wire and cables all having interference suppressing properties and interference suppressors. Ward and Goldstone Ltd, Sampson Wks, Frederick Rd, Pendleton, Manchester 6.

BUSINESS PROSPECTS

Aberdeen. N.E. Hospital Board, 1 Albyn Pl, approve £152,000 out-patients' department at Sick Children's Hospital, Westburn Drive.

Basildon. Hoskins and Son (Essex), Rayleigh, contractors for Transformer and Electrical Co's extensions.

Bexhill. Struth and Co, 77 George St, W.1, surveyors for block of seven-storey shops, flats, etc, Marina, Devonshire Rd, and Eversley Rd.

Birmingham. London and Birmingham Investment Co. plans 34-storey building on The Ringway.—T.C. Tender: Contract 691, 13 one- and two-storey dwellings, Northfield; and Contract 725, 11 two-storey dwellings, Bartley Green. Architect. Contract 749, four children's homes and 15 two-storey dwellings, Bartley Green and West Heath. Architect.

Bishop Auckland. C. Robson and Son, Sutton Chmbrs, 245 Newgate St, Bishop Auckland, architects for Foster and Sons' new tinplate factory.

Bournemouth. Major A. G. McCall, Christchurch Rd, plans three blocks of 74 flats in Christchurch Rd.

Brighouse. The Thornhill Yorkshire Estate Co., 1 Princess St, Huddersfield, plan housing development, Carr Green La.—British MonoRail Ltd. plan offices and factory extensions, Cengar Wks, Wakefield Rd.

Brighton. Samsons Associated Companies, 141 Moorgate, E.C.2, plan 96 flats on Cliveden site, London Rd.

Bristol. Hicks and Dewfall (Bristol), 48 Court Rd, Oldham Common, Bitton, Bristol, to develop land for 33 houses at rear Air Balloon Rd.

Bromley B.C. Tender: 104 flats Turpington La. Engineer.

Cambridge. East Anglican Regional Hospital Board, Cambridge, plan £910,500 psychiatric hospital at Fulbourn.

Cardiff. Frixa, Apex Blds, West Canal Wharf, plan development of East Canal Rd land.—BBC, Portland Pl, W.1, plan buildings at Llandaff.

Chelmsford. Cooper Estates. Wilmington Hse, Wilmington, Kent, plan 108 houses and garages at Beechenlea estate.—Percy Bilton, 54 Uxbridge Rd, Ealing, W.5, plan 18 New Springfield Park estate houses.—R. W. Chandler and Son, 89 Widford Rd, plan block of three-storey dwellings, 93 Moulsham St.—Mr Roff Marsh, 125 London Rd, architect for £55,000 new house units at Essex Home School, Rainsford Rd.

Chester-le-Street. S. Solomon, 30 St. Mary's Pl, Newcastle, plans showrooms and offices at North Burn.

Chesterfield. R. Brown (Gleadless), 169 White La, Sheffield 12, and P. Hassall, 134 Sheffield Rd, Dronfield.

Chippenham. Lackham School of Agriculture to be extended.

Colchester.—E. C. P. Brand, The Central Wks, High St, Braintree, Essex, plans 30 Tey Rd houses.

Corby U.D.C. Several hundred houses planned on Brookside and Mantlefield estates. Surveyor.

Coventry. Dolphin Developments, Duncan Hse, Dolphin Sq, S.W.1, plan 114 flats in 13-storey block and two blocks of three-storeys at Allesley Hall Drive and Allesley Old Rd.

Croydon. Kenneth Anns and Ptnrs, 1 Lincoln's Inn Fields, W.C.2, architects for 23 flats on site of 78 Augustine's Ave, for Abasic Ltd.—Lawdon Developments, 157 Victoria St, W.1, plan 66 flats at 62 Addiscombe Rd, etc.—B.C. Tender: 234 dwellings in two, three and four-storey blocks. Engineer.

Darlington. R.C. Authorities plan new school, Central Ave, Newton Aycliffe.

Doncaster. W. Elland and Son, St. Sepulchures Gate, plan erection of new shops and offices on site of their store.

Dublin. Michael Scott and Assoc, 19 Merrion Sq, Dublin, architects for £¼ million television headquarters at Montrose, Stillorgan Rd, for Radio Eireann.

Durham. Marshall Sisson, Farm Hall, Godmanchester, Huntingdon, architect for £100,000 residential block of St. Mary's College for Durham University.

Essex. £52,615 recreation block planned at Institute of Agriculture.

Felixstowe. B. A. Hatcher, 1 Arcade St, Ipswich, architect for E.A. Hospital Board's alterations and additions to Felixstowe General Hospital.

Gateshead. £30,500 youth and community centre planned, Lobley Hill. Engineer.

Gravesend. Fleetwood, Buss and Anns, 4 Verulam Bldgs, Gray's Inn, W.C.1, quantity surveyors for £130,000 store premises for Chiesmans of Gravesend.

Great Yarmouth. Olley and Haward, 5 Queen St, Gt. Yarmouth, architects for X-ray department and adaptation of old kitchen premises at Northgate Hospital.

Grimsby R.D.C. Lighting improvement planned, North Sea La, Humberston. Surveyor.

Hastings. Nicholson and Ruston, 2 New Sq, Lincoln's Inn, W.C.2, architects for seven-storey block of 14 flats, Grand Parade, for H. Fairweather and Co.—A. C. Draycott, High St, Lancing, Sussex, surveyor for Stage 3 of development of Alexandra Park estate for Hillview Estates.

Henley-on-Thames. Thomas R. Hancock, c/o John Morton and Ptnrs, 1 Church La, Wallingford, Berks, architect for 186 Paradise Row dwellings for Townmakers Ltd.

Hereford. Property Investments (Middlesex), 11 Park Pl, S.W.1, plan shops and offices, Broad St.

Heston and Isleworth. B. N. Whitespunner Ltd, 640 London Rd, Isleworth, plan 14-storey office block with underground car park at London Rd/Worton Way junction.

Hove. R. Green (Properties), Duke St, plan 58 flats on Hangleton site.

Jarrow. Fennell and Baddiley, Bridge End Chmbrs, Chester-le-Street, Co. Durham, architects for Danesfield Maternity Home extensions.

Liverpool. Lord St Investments Ltd, plan 16-storey building, Queen's Sq.—The Fire Salvage Association of Liverpool, Johnson St, Liverpool 3, plan new Derby Rd headquarters.

London. O. E. Parratt, Adelaide Hse, London Bridge, E.C.4, quantity surveyor for Birds Eye Foods' Lower Sydenham cold store.—T. Wall and Sons (Ice Cream), The Friary, Acton, W.3, plan canteen and office block.—Geo Cohen 600 Group, plan offices and canteen building, 23-25 Sunbeam Rd.—George Head and Co, 40 Baker St, W.1, architects for £160,000 industrial building at 31 Brewery Rd, N.7, for Woburn Studios.—Sydney Clough, Son and Ptnrs, 39 Devonshire St, W.1, architects for new Stepney Way dental block for London Hospital, Whitechapel, E.1.—Rebuilding of war-destroyed wing, etc, at Guy's Hse, St. Thomas St, S.E.1, planned.—Playne and Lacey, 19 Queen Anne's Gate, S.W., architects for five-storey nurses' hostel at Holland Park, W, sponsored by King Edward VII Hospital Fund.—D. M. Blouett, 3 Ashley Pl, S.W.1, architect for £112,000 extensions at St. George's R.C. School, Shenshall St, E.17.—C. Lovett Gill and Ptnrs, 41 Russell Sq, W.C.1, architect for 12-storey shops/office block on site of 2-8 Victoria St, S.W.1.—Royal Institution of Chartered Surveyors, 12 Gt George St, S.W.1, plan new building to provide headquarters, Government and Commonwealth offices, etc.—City of London Real Property Co, 16 Mark La, E.C.3, plan ten-storey building at Warwick Rd and Allington St, Westminster.—T. M. Burrows and Ptnrs, 44 Bedford Row, W.C.1, architects for block of Oxford St, W.1, offices.—Ronald Ward and Ptnrs, 29 Chesham Pl, S.W.1, architects for eight-storey offices/flats block at Tottenham Court Rd and Grafton Way, W.1.

Lowestoft. The Zephyr Engineering Wks, Freemantle Rd, plan offices.

Maidstone. Wallis Gilbert and Ptnrs, 5 Cromwell Rd, S.W.1, architects for plate making and lithography building, Tovil Printing Wks, Farleigh Hill, for Alabaster Passmore.—A. J. Townsend and Co, Lulworth, Maidstone Rd, Chatham, plans 40-flat block, 12-flat block and two blocks of terrace houses, James St.—New Thornhill Estates, Foley Hse, Sittingbourne Rd, Maidstone, plan 90 flats in three-storey blocks, Foley House site, Sittingbourne Rd.

Malling R.D.C. Tender: 116 dwellings, Ditton Park. Engineer and Surveyor.

Manchester. P and H. Bailey, Lord St, plan factory and offices at Chatley St.

Mere and Tisbury R.D.C. Tender: 61 dwellings, comprising two schemes. Clerk.

N. Ireland. Franklin and Son, Coventry, plan 19,000 sq ft area factory at Banbridge.—Ministry of Commerce (N.I. Govt.) plans 73,000 sq ft factory at Lisburn for Bridgeport Brass Co., Connecticut.

Newcastle. £400,000 extensions planned for Students' Union, King's College.—Spence and Price, 26 St. Mary's Pl, architects for £126,000 Kenton Secondary School.

Northumberland C.C. £5,400 annexe to Ralph Allan Home, Warkworth, planned. Architect.

Nottingham. £1 million multi-storey casualty block planned at General Hospital.

Pembroke Dock. P. and M. White, Arcade Hse, 27 Old Bond St, W.1, architects for convent on site of London Hse.

Peterlee. W. H. Williamson and Ptnrs, 7 St. Mary's Pl, Newcastle, architects for four-storey office block and five two-storey shops in Town Centre for Peterlee Development Corporation.

Poole. Farmer and Dark, Romney Hse, Tufton St, S.W.1, architects for factory extensions at Loewy Engineering Co's Wallisdown Rd factory.

Preston. Ardin and Brookes and Ptnrs, 6 Cavendish Pl, Cavendish Sq, W.1, architects for town hall site shopping centre for Calgary and Edmonton Land Co.

Prudhoe U.D.C. 84 houses planned on Council estate at West Wylam. Architect, J. M. Angus, 3 Gallowgate, Newcastle.

Ramsgate. B.C. plan conversion of street lighting to electricity in area 1b and 2a at £8,860 and £3,021, respectively.

Sheringham U.D.C. Replacement of gas by electric street lamps. Surveyor.

South Shields. Page, Son and Hill, 75 King St, architects for St. Oswald's School.

Southall. Abbott Bros. (Southall), Brookside Wks, Hayes Bridge, Uxbridge Rd, Hayes, plan five-storey block at High St.

Southport. The Pearl Assurance Co, High Holborn, W.C.1, plan three-storey offices on Lord St.

Stanley. Fennell and Baddiley, Bridge End Chmbrs, Chester-le-Street, architects for eight bungalows, ten houses at Kip Hall Estate and private Hill Top housing estate, East Stanley.

Sunderland. P. J. Stienlet and Son, 4 Queen Sq, Newcastle, architects for R.C. primary school, St. Luke's Rd, Pennywell.—Newcastle Regional Hospital Board, Benfield Rd, Newcastle, plan conversion of nurses' home to laboratories at Royal Infirmary.

Surbiton. E. Firmin and Ptnrs, Thavies Inn Hse, Holborn Circus, E.C.1, architects for £175,000 factory at Cox Rd, Hook.

Sutton. Riches and Blythin and L. C. Holbrook, 16 Northumberland Ave, W.C.2, architects for £65,000 offices, St. Nicholas Rd.

Titchfield. The Plessey Co, Swindon, Wilts, plan takeover of 66-acre former RAF station.

Torquay. Houserenters Investments, Church Rd, St. Marychurch, plan 12-storey block of 72 flats at Castle Cary site.

Business Prospects—Continued

Wallsend. W. E. Edwards and Ptnrs, 5 Claremont Bldgs, Newcastle, architects for Willington County Junior School.—The Northern Coal Board, Whitley Rd, Longbenton, plan new offices. Rising Sun Colliery. Own architects department.

Watford. Gilbert Ash, 2 Stanhope Gate, W.1, contractors for £150,000 City Hse Properties' shops and offices.

West Hartlepool. F. B. Swainston, 14 Dixons Bank, Marton, Middlesbrough, architect for Gales Motors' rebuilding and extension scheme.—T.C.: 204 houses, Owton Manor Estate planned. Architect.

Windsor. John Laing Housing Co, Mill Hill, N.W.7, plan four-year scheme for 46 detached and 198 semi-detached houses in six three-storey blocks, Butlers Farm, Dedworth Rd.

Woking. Ponwood Ltd, plan redevelopment of Grand Theatre corner with six-storey block of shops, offices, etc.

Wolverhampton. Tender: Erection of Institution for the blind and disabled headquarters and workshops, Sedgley. Quantity surveyors, Henry Vale and Sons, 47 Waterloo Rd, Wolverhampton.

Worcester T.C. Tender: 171 Warndon estate dwellings. Engineer, 22 Bridge St.

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

Matlo Electrical Eng. Ltd. Resolution for voluntarily winding-up passed at extraordinary general meeting on 23 Sept.

Electrahome Ltd. Meeting of creditors to be held at Bonnington Hotel, Southampton Row, W.C.1, on 15 Nov., at 3 p.m. Secured creditors to send details to registered office of the company by 4 p.m., 14 Nov.

Penelectric Appliance Co. Ltd. Creditors to send details to liquidator: R. W. Hellyer, Brotherton Chmbrs, Westgate, Leeds 1, by 15 Dec.

Apollo Electrical Appliances Ltd. General meeting of members to be held at 9 Mansfield St, W.1, on 24 Nov., at 11 a.m., to receive the liquidator's report.

Leslies Electricals Ltd. Meeting of creditors to be held at 112 Crescent Rd, Reading, Berks, on 14 Nov., at 3.15 p.m.

F.S. Domestic Appliances (Dalston) Ltd. Petition for winding-up to be heard before the High Court of Justice, Strand, W.C.2, on 14 Nov. Persons intending to appear to notify J. E. Baring and Co., Bank Chmbrs, 1 John St, W.C.1, by 1 p.m., 12 Nov.

Vactric Ltd. Petition for winding-up to be heard before the High Court of Justice, Strand, W.C.2, on 14 Nov. Persons intending to appear to notify Coward, Chance and Co., St. Swithin's Hse, Walbrook, E.C.4, by 1 p.m., 12 Nov.

Reeves Electrical and Radio Co. Ltd. Petition for winding-up to be heard before the High Court of Justice, Strand, W.C.2, on 14 Nov. Persons intending to appear to notify M. G. Whittome, King's Beam Hse, Mark La, E.C.3, by 1 p.m., 12 Nov.

Rototast Electronic Controls Ltd. Petition for winding-up to be heard before the High Court of Justice, Strand, W.C.2, on 14 Nov. Persons intending to appear to notify Simpson, North, Harley and Co., 6 York Bldgs, Adelphi, W.C.2, by 1 p.m., 12 Nov.

Ideal Electrics (Middlesbrough) Ltd. Meeting of creditors to be held at Wellington Hotel, Albert Rd, Middlesbrough, on 18 Nov., at 11 a.m. Secured creditors to send details to registered office: 283 Linthorpe Rd, Middlesbrough, before the meeting.

O'Harro and Woods Ltd. Mr L. H. Shipton, 31 Lloyd St, Manchester 2, and Mr R. A. Hawken, 1 John St, Bedford Row, W.C.1, appointed joint liquidators at extraordinary general meeting on 25 Oct.

Companies Winding-up

Gowan Wells (Agencies) Ltd., lately trading at 3a The Terrace, Wokingham, Berks, agents for electrical goods.

The statement of affairs submitted by Mr Wells showed unsecured liabilities of £5,832 (£5,303 trade accounts) and preferential debts of £34, while assets were valued at £1,307.

The company's business was mainly that of manufacturers' agents selling electrical goods to manufacturing concerns (and sometimes their employees) at discount rates, usually about 15% below retail price. Mr Wells attributed the failure of the company to lack of capital and to his own commercial inexperience.

BANKRUPTCY ACTS

Receiving Orders

Bradford. P. W. Nelson, electrical retailer and engineer, formerly carrying on business as S.R. Services at 543 and 551 Wakefield Rd and at 4 and 32 Town Gate, Wyke, Bradford. Receiving order dated 27 Oct.

Leeds. H. G. Duff, radio, television and electrical dealer, carrying on business at 7 Canal Rd and 8 Dodsworth Court, Leeds. Receiving order dated 27 Oct.

Oxford. T. Last, electrical dealer, trading as Oxford D.A. Specialists, 33 Cowley Rd. Receiving order dated 26 Oct.

First Meetings and Public Examinations

Wigan. J. Ball, electrical contractor, formerly carrying on business at 36 Crompton St. First meeting: 11.30 a.m., 10 Nov., at Official Receiver's Office, West Africa Hse, 25 Water St, Liverpool 2, and public examination: 11 a.m., 16 Jan., at Court Hse, Crawford St, Wigan.

York. M. W. P. Walsh, electrical goods dealer, formerly carrying on business at 59 Holgate Rd. Public examination: 10.30 a.m., 8 Dec., at Law Courts, Clifford St, York.

Croydon. T. G. Davison, electrical dealer, carrying on business as Woolwich Vacuum Supplies, 14 Perry Hall Close, Orpington. First meeting: 11.30 a.m., 11 Nov., at 58-61 York Terr, Regent's Pk, N.W.1; and public examination: County Court, Scarbrook Rd, Croydon.

Intended Dividend

Croydon. H. F. Mouncey, electrical engineer, of 4 Cromer Rd, S.W.17. Last day for receiving proofs for intended dividend: 11 Nov., to trustee: W. J. W. Hill, 58-61 York Terr, Regent's Park, N.W.1.

Dividend

Bradford. M. R. Dixon, plumber and electrical contractor, formerly carrying on business at 792 Leeds Rd. Dividend per £: 2s 10¼d, payable on 11 Nov., at 36 North Parade, Bradford.

Rescinding Order

Halifax. G. H. Collins, electrical engineer, lately carrying on business at Astoria Bldgs, Brighouse. Receiving order dated 27 Aug., 1958, rescinded as from 4 Oct.; all debts paid in full.

Application for Discharge

Exeter. B. G. Slater, electrical engineer, formerly carrying on business at 12 George St, Exmouth. Application for discharge to be heard at The Castle, Exeter, on 24 Nov., at 2 p.m.

MEETINGS TO NOTE

THURSDAY, 10 NOV.

I.E.E. (Utilisation Section). "The Logmotor—A Cylindrical Brushless Variable-Speed Induction Motor," Professor F. C. Williams, E. R. Laithwaite, J. F. Eastham and L. S. Piggott. "Brushless Variable-Speed Induction Motors Using Phase-Shift Control," Professor F. C. Williams, E. R. Laithwaite, J. F. Eastham and W. Farrer. Savoy Pl, W.C.2. 5.30 p.m.

I.E.E. (W. Wales). "The Shielding of Overhead Lines Against Lightning," J. H. Gridley. Conference Room, S. Wales Electricity Board, The Kingsway, Swansea. 6 p.m.

INSTITUTION OF CIVIL ENGINEERS. Discussion: "The Economics of Airlifts for Major Construction," Gt. George St, S.W.1. 5.30 p.m.

INSTITUTION OF PRODUCTION ENGINEERS (N. Midlands). "Machine Tool Control," C. J. Charnley. Queen's Hall, Grand Hotel, Leicester. 7.15 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Liverpool). "Some Recent Advances in Radiation Pyrometry," B. W. Barley, M.A.N.W.E.B. Industrial Development Centre. 7 p.m.

BRITISH INSTITUTION OF RADIO ENGINEERS (Scottish). V.H.F. AM/FM Transistor Receivers," H. A. Heins. Institution of Engineers and Shipbuilders, Elmbank Cres, Glasgow. 7 p.m.

A.S.E.E. (Bradford and District). "Power Transformers," J. Bennett. Midland Hotel. 7.30 p.m.

A.S.E.E. (S.W. London). "Under-floor Heating." L. Bishop; and "Maintenance of an Electroplating Plant," B. Mitchison. Prince of Wales Hotel, S.W.19. 8.30 p.m.

FRIDAY, 11 NOV.

I.E.E. Joint meeting with Royal Aeronautical Society. "The Future of 'Electrics' and 'Electronics' in Aircraft and Guided Missiles," The Rt Hon The Viscount Caldecote. Savoy Pl, W.C.2. 5.30 p.m.

I.E.E. (Tees-side). Annual dinner and Reunion, Zetland Hotel, Saltburn-by-the-Sea. 7.30 p.m.

JUNIOR INSTITUTION OF ENGINEERS. "Railway Signalling Problems in a.c. Traction Areas," 'H. J. N. Riddle. Pepys' Hse, 14 Rochester Row, S.W.1. 7 p.m.

E.P.E.A. (Meter Engineers' Technical Group). Discussion: "Prepayment Methods." Caxton Hall, Westminster, S.W.1. 6.30 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Midlands). "The Common-sense Approach to Instrument Manufacture," C. E. T. Cridland. Lecture Theatre of the Byng Kendrick Suite, at the Gosta Green College of Technology, Aston St, Birmingham. 7 p.m.

E.I.B.A. BALL at Grosvenor Hse, at 7 p.m.

MONDAY, 14 NOV.

I.E.E. (Electronics and Communications Section). Discussion: "Tunnel-Diode Application and Circuitry." Savoy Pl, W.C.2. 5.30 p.m.

I.E.E. (Mersey and N. Wales). "Teaching and Learning Machines," C. E. G. Bailey. Joint meeting with the North Western Association of the Institution of Civil Engineers. Town Hall, Chester. 6.30 p.m.

I.E.E. (Western). "The Measurement Basis of Electricity Supply Metering," J. W. Skinner. South Wales Institute of Engineers, Cardiff. 6 p.m.

I.E.E. (N.E. Measurement and Electronics). "Thermistors—Their Theory, Manufacture and Application," R. W. A. Scarr and R. A. Setterington. Rutherford College of Technology, Newcastle. 6.15 p.m.

I.E.E. (E. Anglia). "The Oral Presentation of Scientific Material," A. Clow. Technical College, Cambridge. 6.30 p.m.

I.E.E. (S. Midlands Supply and Utilisation Group). "Some Considerations in the Application of Power Rectifiers and Converters," J. P. McBreen College of Technology, Gosta Green, Birmingham. 6 p.m.

INSTITUTION OF MECHANICAL ENGINEERS (Ind. Admin. and Eng. Production Group). Discussion: "Adhesives Engineering." Birdcage Walk, S.W.1. 6 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Manchester). "Intrinsic Safety Requirements," H. C. Lister. College of Science and Technology, Sackville St. 6.45 p.m.

I.E.S. (Sheffield). "History of Lighting," J. W. T. Walsh. Grand Hotel. 6.30 p.m.

PUBLIC WORKS AND MUNICIPAL SERVICES EXHIBITION at Olympia until 19 Nov.

JUNIOR INSTITUTION OF ENGINEERS (Sheffield). President's address: "Some Recent Developments in Public Electricity Supply," A. Haddock. Livesey Clegg Hse, 44 Union St. 7.30 p.m.

A.S.E.E. (Bournemouth and District). "Stage Lighting." Grand Hotel, Firvale Rd. 8 p.m.

A.S.E.E. (Central London). "Panelec Underfloor Heating," E. A. Moneypenny. White Hall Hotel, Bloomsbury Sq, W.C.1. 7.15 p.m.

A.S.E.E. (N.W. London). "Variable Speed Drives," V. W. Press. Century Hotel, Wembley. 8.15 p.m.

TUESDAY, 15 NOV.

I.E.E. (Measurement and Control Section). "Discrete Analogue-Computer Compensation of Sampled Data Control Systems," T. Glucharoff. Savoy Pl, W.C.2. 5.30 p.m.

Meetings to Note—continued

I.E.E. (N.W. Measurement and Control Group). Lecture: "The Behaviour of Protective Current Transformers Under Fault Conditions," J. W. Hodgkiss. Engineers' Club, Manchester. 6.15 p.m.

I.E.E. (Scottish). Centre Dinner-dance. Grosvenor Restaurant, Glasgow. 6.30 p.m.

I.E.E. (N. Midlands Utilisation Group). "Electricity in the Manufacture of Hydrogen Peroxide," B. E. A. Vigers and R. O. Fletcher. Bradford Institute of Technology. 6.30 p.m.

I.E.E. (Southern). "The Shielding of Overhead Lines Against Lightning," J. H. Gridley. Technical College, Farnborough. 6.15 p.m.

I.E.E. (Cambridge Electronics and Measurement Group). Electronics and Communications Section Chairman's Address: "Channelling—A Sketch," T. B. D. Terroni. Cavendish Laboratory. 8 p.m.

I.E.E. (N. Staffs Graduates and Students). "Interference Between Communications and Power Circuits," E. J. Waddon. Stafford.

I.E.E. (Southern Graduates and Students). "Power Distribution," K. P. Boxal. C.E.G.B. Offices, High St, Portsmouth. 6.30 p.m.

I.E.S. (Liverpool). "Ship Lighting Perils and Prospects for the Lighting Engineer," J. T. Grundy and C. H. Vaughan. Electrical Industrial Development Centre of the Merseyside and N. Wales E.B., Paradise St. 6 p.m.

A.S.E.E. "The Application of Transistors and Other Semiconductor Devices in Industry," D. D. Jones and E. Jackets. Magnet Hse, Kingsway, W.C.2. 6.30 p.m.

A.S.E.E. (E. Kent). "Television Broadcasting Engineering," L. G. Dyke. Clarendon Hotel, Broadstairs. 8 p.m.

A.S.E.E. (Oxford and Districts). "Electrical Aids to Labour Saving in the Home," Miss Lois Stevens. Employment Exchange. 8 p.m.

A.S.E.E. (W. Kent). "Railway Electrification." Rose and Crown Hotel, Tonbridge. 7.30 p.m.

WEDNESDAY, 16 NOV.

I.E.E. (Supply Section). "Radiocommunication in the Power Industry," E. H. Cox and R. E. Martin. Savoy Pl, W.C.2. 5.30 p.m.

I.E.E. (S. Western). "The Post Office Type 10P Valves for Submarine Telephone Repeaters," F. H. Reynolds. S.W.E.B. Electric Hall, Torquay. 3 p.m.

I.E.E. (Sheffield). "A Survey of Street Lighting and Its Future," W. R. Stevens and H. M. Ferguson. University, Mappin St, Sheffield. 6.30 p.m.

I.E.E. (S. Midlands). Faraday Lecture: "Transistors and All That," L. J. Davies. Temple Speech Room, Rugby. 6.30 p.m.

INSTITUTION OF MECHANICAL ENGINEERS (Education Group). "Teaching of Metallurgy to Engineers," Professor J. G. Ball. Birdcage Walk, S.W.1. 6 p.m.

BRITISH INSTITUTION OF RADIO ENGINEERS (Computer Group). "Digital Computing Elements for Instructional Use," Lt-Col I. W. Peck. London School of Hygiene and Tropical Medicine, Keppel St, W.C.1. 6.30 p.m.

BRITISH INSTITUTION OF RADIO ENGINEERS (Merseyside). "The Design of High Quality Sound Reproducing Equipment," R. T. Lakin, K. Davin and F. C. Gibson. The Adelphi Hotel, Liverpool. 7 p.m.

A.S.E.E. (Nottingham). "Electrical Thermal Storage Heating," P. G. Cope. Nottingham Mechanics Institution, Trinity Sq. 7.30 p.m.

A.S.E.E. (Wolverhampton and District). "Photoelectric Control Equipment in Industry," C. J. Teece. Chamber of Commerce, District Bank Chmbrs, Lichfield St. 7.45 p.m.

ELECTRICAL ASSOCIATION FOR WOMEN. "Plastics in the Home," M. Kaufman. I.E.E., Savoy Pl, W.C.2. 2 p.m.

THURSDAY, 17 NOV.

I.E.E. (Southern). "Engineering Education of the Technical Universities in Western Germany," D. B. Welbourn, Professor D. B. Spalding and G. L. Ashdown. (Joint meeting with Southern Branch of I.Mech.E.). Central Electricity Generating Board Offices, 111 High St, Portsmouth. 6.30 p.m.

I.E.E. (Irish). "Aviation. Navigational Systems," G. Jones. Physical Laboratory, Trinity College, Dublin. 6 p.m.

CHELMSFORD ENGINEERING SOCIETY. "Engineering Aspects of the Zeta Project," P. B. Clarke. Crompton's Social Hall. 7.30 p.m.

INSTITUTION OF PLANT ENGINEERS (Blackburn). "The Automatic Control of Level in Boilers," C. G. Scolding. Castle Hotel. 7.30 p.m.

DIESEL ENGINEERS AND USERS' ASSOCIATION. "The Practical Application of Torque Converters," R. G. Hill. Institute of Marine Engineers, 76 Mark La, E.C.3. 2.30 p.m.

S. WALES INSTITUTE OF ENGINEERS. "The Application of Electrical Engineering Principles in a Modern Tinplate Industry," J. Nelsey. Park Pl, Cardiff. 6 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Control Section). "The Control of a Single Effect Concentrating Evaporator—Dynamic Characteristics and Analogue Computer Study," F. P. Lees, L. W. A. Glasson and J. A. Anderson. Manson Hse, 26 Portland Pl, W.1. 7 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Grangemouth). "Spectrophotometers," R. A. C. Isbell. Leapark Hotel. 7 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Bristol). "Instrumentation in the Red-Brick Industry," M. E. C. Stedham. University of Bristol, Dept. of Physics, The Royal Fort. 7.30 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (E. Midlands). "The Wavelength Standard of Length," K. J. Hume. Derby and District College of Technology, Kedleston Rd, Derby. 7.15 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Newcastle). "The Evaluation of Industrial Instruments," D. M. Bishop. Conference Room, Roadway Hse, Oxford St. 7 p.m.

FRIDAY, 18 NOV.

I.E.E. (N. Midlands). Annual dinner. Queen's Hotel, Leeds. 7 p.m.

I.E.E. (N. Staffs). "Radiocommunication in the Power Industry," E. H. Cox and R. E. Martin. Technical College, Stoke. 7 p.m.

JUNIOR INSTITUTION OF ENGINEERS. Chairman's address: "Simple Instruments for Tanks and Pipelines," E. M. Baskerville. Pepys' Hse, 14 Rochester Row, S.W.1. 7 p.m.

MONDAY, 21 NOV.

I.E.E. (N. Western). Discussion: "The Teaching of Electrical Network Theory and Its Applications of Electrical Engineering." Engineers' Club, Manchester. 6.15 p.m.

I.E.E. (N. Eastern). "Radiocommunication in the Power Industry," E. H. Cox and R. E. Martin. Neville Hall, Westgate Rd, Newcastle upon Tyne. 6.15 p.m.

I.E.E. (W. Utilisation Group). "The Characteristics and Protection of Semiconductor Rectifiers," D. B. Corbyn and N. L. Potter. South Western Electricity Board Demonstration Theatre, Old Bridge, Bath. 6 p.m.

I.E.E. (Sheffield). "Subscriber Trunk Dialling," D. A. Barron. Angel Hotel, Brigg. 7 p.m.

I.E.E. (Reading). "Electronics in the Postal Mail Services," G. P. Copping. George Hotel, King St. 7.15 p.m.

I.E.E. (London Graduates and Students). "Magnetic Amplifiers in Power Engineering," M. J. Pope. Savoy Pl, W.C.2. 6.30 p.m.

BIRMINGHAM ELECTRIC CLUB. "The Fuel Cell—A Logical Development in the Conservation of Natural Resources," P. W. Jones. Grand Hotel. 6.15 p.m.

I.E.S. (Bath and Bristol). "Lighting for Production," W. Guscott. S.W.E.B. Demonstration Theatre, Bristol.

I.E.S. (Leeds). "Eye Strain and Glare Disabilities in Relation to Artificial Lighting," G. Black. British Lighting Council, 24 Aire St. 6.15 p.m.

IPSWICH AND DISTRICT ELECTRICAL ASSOCIATION. "50 c/s Single-phase A.C. Electrification on British Railways," J. W. Greeve. Electric Hse. 7.15 p.m.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons Ltd., 116 Chancery La, W.C.2.

Avonbourne Electrical Co. Ltd., 12 Parkstone Rd, Poole, Dorset. Nom. cap.: £5,000. Dealers in domestic and household appliances, etc. Dirs.: Peter E. Wren and Ernest F. Spinney.

E. Booth and Son Ltd., 82 Abbey St, Nuneaton. Manufacturers of and dealers in radio, electrical and mechanical apparatus, etc. Nom. cap.: £2,000. Dirs.: Edwd. Booth and Alexina M. Booth.

B. Butler (Ripon) Ltd., 4 High Shellgate, Ripon. Manufacturers of and dealers in radio and electrical apparatus, etc. Nom. cap.: £4,000. Dirs.: Benjamin Butler and Mrs Joan M. Butler.

Alex Coleman Ltd. Manufacturers of and dealers in radio, electrical and mechanical apparatus, etc. Nom. cap.: £1,000. Dirs.: Alexander E. Coleman and Irene Coleman, Nyima, Buller Rd, Thornton Heath, Surrey.

Demalco Ltd., 6 Surrey St, W.C.2. Manufacturers of and dealers in vacuum cleaners, etc. Nom. cap.: £100. Dirs.: To be appointed by subs. Subs.: Stanley H. Lucas and Francis A. Dean.

Don and Dearne Electrical Ltd., Waterside Mills, Greenfield, Oldham. Nom. cap.: £100. Dirs.: Rupert E. T. Nichols and Roger M. Tomson.

Electrical Contractors (Manchester) Ltd., 19 Great Dulcie St, Manchester 3. Nom. cap.: £500. Dirs.: Albert W. S. Little and Albert V. Little.

E.W.N. Electrics Ltd. Nom. cap.: £1,000. Dirs.: Ernest Nott and Mrs Eleanor M. Nott, 15 Hazelmere Close, Bedfont, Feltham, Middx.

G.W. Electrical Ltd., 123 Pall Mall, S.W.1. Nom. cap.: £100. Dirs.: Louis H. Watt and Stanley A. Green.

J. D. Hall Ltd. Manufacturers of and wholesale and retail dealers in and agents for domestic household and general electrical equipment, etc. Nom. cap.: £500. Dirs.: John D. Hall and Mrs Ethel E. Hall, "Pinhay," Yarningdale Common, Claverdon, Warwicks.

Hesa Electrical Wholesale Co. Ltd., 892a Uxbridge Rd, Hayes, Middx. To take over the business carried on at Hayes by S. R. Hansell, etc. Nom. cap.: £5,000. Dirs.: Stanley R. Hansell and Mrs Jamesina M. Weedon.

Home Electrical Products (Midlands) Ltd., 39 Queens Rd, Coventry. Nom. cap.: £100. Dirs.: Arthur T. Bowring, James R. B. Park, Leonard W. Kemp and Walter H. Jones.

Home Electrical Products (Northern) Ltd. Nom. Cap.: £100. Other particulars are similar to Home Electrical Products (Midlands) Ltd.

Home Electrical Products (Southern) Ltd., 39 Queens Rd, Coventry. Letters of and dealers in electrical and domestic appliances, etc. Nom. cap.: £100. Dirs.: Arthur T. Bowring, James R. B. Park, Leonard W. Kemp and Walter H. Jones.

Kerstar Ltd., 16 Sheep St, Northampton. Electrical engineers, etc. Nom. cap.: £1,000. Dirs.: Hugh F. Kerins and Veljko Starcevic.

D. R. Kershaw Ltd., "Villa Neptune," Seafield Park Rd, Hillhead, nr. Fareham, Hants. Electrical contractors, radio and television engineers, etc. Nom. cap.: £100. Dirs.: Delwyn R. Kershaw and Mrs Sylvia I. Kershaw.

G. T. M. Lampkin Ltd., 3 Acorn Rd, Gillingham, Kent. Electrical contractors, engineers, etc. Nom. cap.: £1,000. Dirs.: Geo. T. M. Lampkin and Mrs Alma E. Lampkin.

L.D.P. Consultants Ltd., 52 Bedford Row, W.C.1. Consultants in the installation and application of all forms of cybernetic systems, etc. Nom. cap.: £100. Dirs.: Brian D. Corbett and John K. Melling.

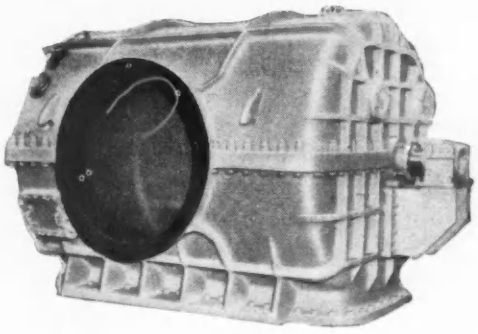
C. S. Martin Holdings Ltd. General, electrical and mechanical engineers, etc. Nom. cap.: £9,500. Dirs. not named. Subs.: Wm. Leask, 56 Wavertree Drive, Leicester; and Margaret E. Tibbles, 217 Glenfield Rd, Leicester.

E. M. McNally Ltd., 159 Lytham Rd, Blackpool. Electrical goods dealers, etc. Nom. cap.: £100. Dirs.: Arthur MacNally and Mrs Eileen M. NacNally.

M. and R. Electrical Services Ltd., The Gables, Station Rd, Ystradgynlais, Swansea. To take over the business carried on by company of same name at Ystradgynlais, Swansea, etc. Nom. cap.: £1,000. Permanent dirs.: Stanley Morgan and Mrs Mary Morgan.

Roston Electrical Ltd., 434 Euston Rd, N.W.1. Nom. cap.: £1,000. Dirs.: Basil B. Stone and Elsie M. Stone.

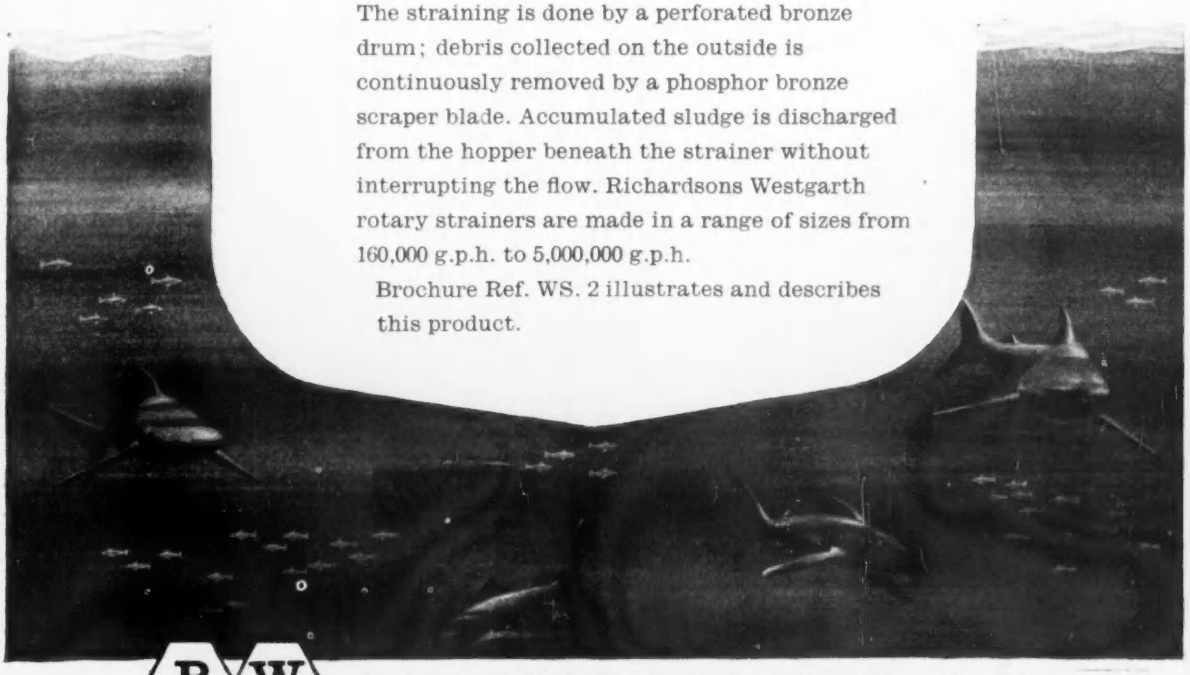
Telephone Maintenance and Installations Co. Ltd., Ferndown, Northwood Hills. Nom. cap.: £100. Dirs.: Colin Will and Leonard M. Davis.



Enough water to float the 'Queen Mary'

Six Richardsons Westgarth 'Deptford' rotary water strainers strain the condenser cooling water at the Aberthaw Power Station, and are capable of handling 20,000,000 gallons in forty minutes—enough water to float the 'Queen Mary'. The straining is done by a perforated bronze drum; debris collected on the outside is continuously removed by a phosphor bronze scraper blade. Accumulated sludge is discharged from the hopper beneath the strainer without interrupting the flow. Richardsons Westgarth rotary strainers are made in a range of sizes from 160,000 g.p.h. to 5,000,000 g.p.h.

Brochure Ref. WS. 2 illustrates and describes this product.

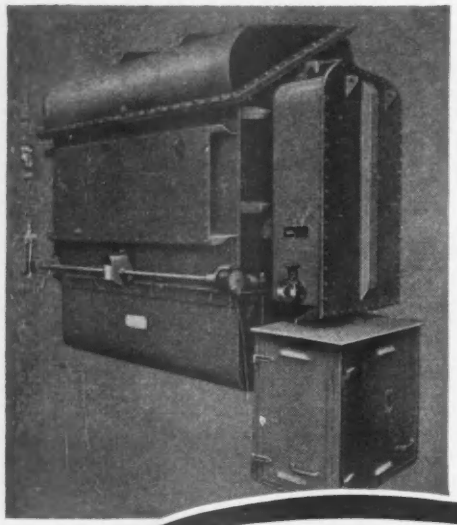


RICHARDSONS WESTGARTH (HARTLEPOOL) LTD.

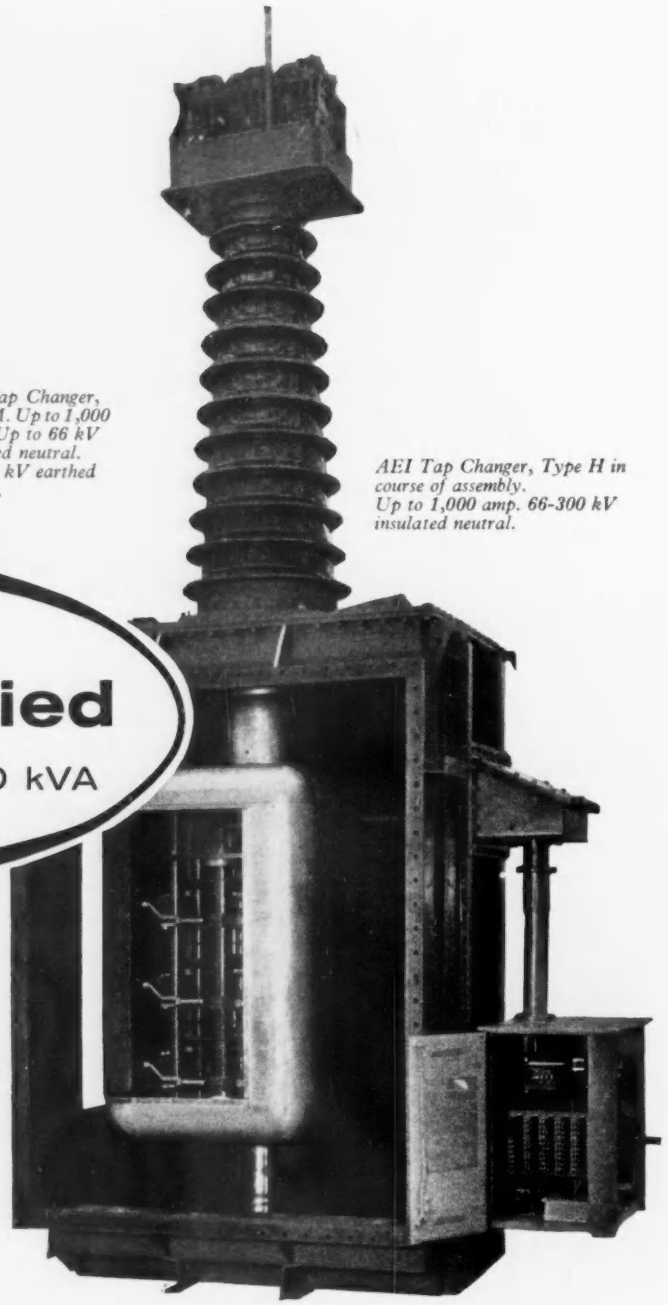
A member of the Richardsons Westgarth Group

Hartlepool, Co. Durham and at 58 Victoria Street, London, S.W.1.
59 Mosley Street, Manchester, 75 Buchanan Street, Glasgow.

RW 58



AEI Tap Changer, Type M. Up to 1,000 amp. Up to 66 kV insulated neutral. 66-275 kV earthed neutral.



AEI Tap Changer, Type H in course of assembly. Up to 1,000 amp. 66-300 kV insulated neutral.

Over 1,300 supplied

aggregating 30,000,000 kVA

AEI HIGH-SPEED RESISTANCE ON-LOAD TAP CHANGERS

Since 1933, AEI have supplied over 1,300 high-speed resistance on-load tap changers with an aggregate of 30 million kVA.

Here are some of the reasons why people chose—and have gone on choosing—these outstanding units:

- ★ **Reliable operation**
- ★ **Long life contacts**
- ★ **Low maintenance**
- ★ **Iron-clad units**
- ★ **Positive follow-up device (patented)**
- ★ **Minimum oil carbonisation**

AEI on-load tap changers for transformers are used for power and distribution, electric furnaces, rectification, voltage regulation and traction.

For further details write to your local AEI office or direct to AEI Transformer Division, Southmoor Road, Wythenshawe, Manchester, 23.

AEI

Associated Electrical Industries Ltd.

Transformer Division

MANCHESTER & RUGBY, ENGLAND

E/A001

CLASSIFIED ADVERTISEMENTS

PUBLIC NOTICES

ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS

Diploma Scheme and Premium Awards 1961

Notice is hereby given that the oral section of the A.S.E.E. Diploma Examination will be held at London and Provincial Centres on 16, 17 and 18 May, 1961. The subjects for the examination are Electrical Installation Practice and/or Electrical Maintenance. The Scheme provides for the award of Premiums.

Application forms and details of the examination may be obtained from the undersigned at 23 Bloomsbury Square, London W.C.1.

The latest date for receipt of applications to enter the examination is 1 March, 1961.

E. A. BROMFIELD,
General Secretary.
(S 494)

TENDERS INVITED

BOROUGH OF COLWYN BAY

Street Lighting Conversion Scheme
Contracts No's. 1-7

TENDERS are invited for the following works and materials:

Contract No. 1. Class "A" Lighting—supply and installation of 99 No. Class "A" concrete columns together with sodium lanterns, etc.
Contract No. 2. Supply of 480 No. Class "B" concrete columns.
Contract No. 3. Supply of 480 No. sodium lanterns, 60 watt sodium lamps and control gear.
Contract No. 4. Supply of 270 No. time switches.
Contract No. 5. Erection and installation of 480 No. Class "B" lighting units complete.
Contract No. 6. Laying of cable ducts.
Contract No. 7. Removal of existing gas lamps.

Separate tenders are required for each Contract and documents may be obtained from Mr H. WILMAN, A.M.I.C.E., Borough Engineer and Surveyor, Whalley Range, Lansdowne Rd, Colwyn Bay. Suppliers should note that the offer of alternative equipment for each Contract will be welcomed but that separate tender documents will be required for each alternative; they must therefore state clearly the Contracts

continued in next column

continued from previous column

for which they require documents and the number of documents required.

Tenders in plain filled envelopes endorsed "Street Lighting Conversion Scheme, Contract No. . . . ." must be delivered to the undersigned not later than 12 noon on Saturday, 3 Dec., 1960.

HAROLD E. BRAITHWAITE,
Town Clerk.

Town Hall,
Colwyn Bay.
7 Nov., 1960. (S 546)

COUNTY COUNCIL OF THE COUNTY OF LANARK

Trunk Road Lighting Dewshill A.8.

THE County Council invite Tenders for the following Street Lighting Furniture:

1. 8—280-watt Sodium Discharge Lanterns, suitable for housing a single 280-watt sodium discharge lamp, or alternatively two conventional type 140-watt sodium discharge lamps.
2. 16—Totally Enclosed Leak Transformers.
3. 16—Totally Enclosed Capacitors.
4. 8—Steel Street Lighting Columns, complete with a 9-foot outreach bracket arm. The whole assembly to give a mounting height of 35 ft. The columns should be suitable for underground distribution.

Tenders will be considered for the whole or any portion of the works and the County Council does not bind itself to accept the lowest or any tender.

Manufacturers desirous of tendering should make application for the tender documents to the Depute County Lighting Enginger, Beekford St, Hamilton.

Tenders will not be considered unless enclosed in a plain sealed envelope endorsed "Trunk Road Lighting" and must be delivered to the Depute County Lighting Engineer, County Bldgs, Hamilton, not later than 10 a.m. on Monday, 28 Nov., 1960.

IAN V. PATERSON,
County Clerk.

Lanarkshire Hse,
191 Ingram St,
Glasgow C.1.
5 Nov., 1960. (S 528)

BOROUGH OF CAERNARVON

Group "A" Street Lighting - Trunk Road 81. A.499

TENDERS are invited for the supply and erection of 86 plain steel columns and brackets complete with 140 watt sodium discharge lighting units at a mounting height of 25 ft, and the supply only of 14 wall brackets with 140 watt sodium discharge lighting units, together with control gear, time switches, etc.

Plans may be inspected at, and the Specification, Bills of Quantities and Form of Tender may be obtained from, the Borough Engineer and Surveyor at this office.

Tenders in plain sealed envelopes endorsed "Trunk Road Lighting Scheme," to be delivered to the undersigned not later than 25 Nov., 1960.

The Council do not bind themselves to accept the lowest or any Tender.

J. O. SMITH,
Town Clerk.

Swyddfa'r Dref,
High St,
Caernarvon. (S 492)

CAMBRIDGESHIRE COUNTY COUNCIL

Street Lighting

TENDERS are invited for the supply, delivery, erection, wiring and fitting of:

1. (a) Nine No. 35 ft steel columns with 200-watt sodium discharge lamps at Caxton Gibbet Roundabout (Routes A45 and A14).
(b) Eight No. 35 ft steel columns with 200-watt sodium discharge lamps at Four Went Ways Roundabout, Abingdon (Routes A11 and A604).
2. Five No. 25 ft steel columns with 3 × 80-watt white fluorescent lamps at Bury Toll Junction, Nr. Newmarket (Routes A11 and A45).

Documents and full details may be obtained from the County Surveyor, Shire Hall, Castle Hill, Cambridge, and must be returned to the undersigned by 9.30 a.m. on Saturday, 3 Dec., 1960.

The Council do not bind themselves to accept the lowest or any Tender.

CHARLES PHYTHIAN,
Clerk of the Council.

Shire Hall,
Castle Hill,
Cambridge. (S 517)

APPOINTMENTS VACANT

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for a superannuable appointment as an

ASSISTANT SHIFT CHARGE ENGINEER

at Portobello Generating Station, Edinburgh.

Applicants should have had considerable experience in the operation of modern turbo-alternator and boiler plant and, preferably, possess a Higher National Certificate in Electrical or Mechanical Engineering.

Salary: N.J.B. Class K, Grade 8, £1,275/£1,410, plus shift allowance of 10% per annum.

Applications, quoting reference G36/60, should be submitted on the appropriate form to the Secretary, South of Scotland Electricity Board, Inverlair Ave, Glasgow S.4, not later than 25 Nov., 1960. (S 529)

LONDON ELECTRICITY BOARD

ASSISTANT DISTRIBUTION ENGINEERS (TWO)

APPLICATIONS are invited for the above positions in the Board's North Eastern District at Electric Hse, Church Hill, Walthamstow, E.17.

Applicants should have had a sound technical education to the standard of the Higher National Certificate, and possess practical experience in all branches of engineering work associated with the organisation of a District distribution deparment.

The posts are graded under Schedule A of the National Joint Board Agreement as Class G, Grade 11, £875 per annum rising to £990 per annum, inclusive of London Area Allowance.

Applications stating age, qualifications and experience should be addressed to the District Manager at the above address. Please quote ref.: PER/V/3001/T. (S 535)

CITY ARCHITECT'S OFFICE, MANCHESTER

APPLICATIONS invited for appointment on the permanent staff of:

ASSISTANT ELECTRICAL ENGINEER

Salary: Special Scale, £840/£1,145 per annum. Candidates should preferably have passed the final examination for membership of the Institution of Electrical Engineers and be experienced in the design and supervision of electrical installations in all types of buildings. Five-day week. Housing accommodation may be provided for a limited period. Removal expenses allowed.

Forms of application from the City Architect, Town Hall. Returnable by 21 Nov., 1960. (S 498)

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 40s. per inch, and all other classified advertisements at 3s. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

FEDERAL GOVERNMENT OF NIGERIA

ELECTRICAL ENGINEERS

ELECTRICAL Engineers are required for the Works Division of the Federal Ministry of Works and Surveys to design, supervise and maintain electrical installations in Government buildings, hospitals, staff quarters, etc., and to investigate and apply modern forms of wiring to tropical conditions.

Candidates must possess a University Degree in Electrical Engineering or Associate Membership of the Institution of Electrical Engineers or exemption from Parts I, II, III of the Examination of the Institution of Electrical Engineers, with post-graduate experience of at least two years' duration with an electrical installation contractor or a large supply company.

Candidates should preferably have had experience in all classes of electrical installation work in large public buildings, including the design, estimation, contract procedure, inspection and testing. A knowledge of oil engine stand-by generating plant, tariffs and power factor correction will be an advantage. Applicants must be between the ages of 28 and 45 years of age.

Appointment on contract for one tour of 12 to 18 months in the first instance. Salary, according to age and experience, £1,434/£2,196 p.a. (including Inducement Addition), plus gratuity of £100/£150 p.a. for satisfactory service. An outfit allowance of £60 is paid on salaries up to £1,740 p.a. inclusive. Free passages for officer and wife. Children's allowances while separated. Home leave on full pay. Income tax at low rate. Rent at low cost.

Candidates should write for application forms and further particulars stating age, qualifications and experience, to the Appointments Secretary, Federal Public Service Commission, Nigeria Hse, 9 Northumberland Ave, London W.C.2, quoting V.12/1. (S 503)

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

APPLICATIONS are invited for the position of

FOURTH ASSISTANT ENGINEER (TELECOMMUNICATIONS)

at the Grid Control Centre, Birmingham.

Applicants should have good technical qualifications and be experienced in the application of telecommunication techniques for supervisory controls, telemetering and automatic telephones. Experience in one of the Generating Board's Grid Control Centres would be considered an advantage. Previous applicants will be re-considered and need not re-apply.

The salary will be in accordance with the N.J.B. Agreement, Schedule B, Scale 11, Grade 9, Class CX, £1,005/£1,410 per annum.

Applications, quoting vacancy number 300/60MD, to be made on form AE6 available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13. Closing date for receipt of applications: 21 Nov., 1960. (S 501)

LEEDS COLLEGE OF TECHNOLOGY

Calverley Street, Leeds, 1.

Principal: C. CHEW, M.SC.TECH., F.R.I.C.

SENIOR LECTURER IN ELECTRICAL ENGINEERING

REQUIRED as soon as possible. Applicants should have a good degree in the subject with industrial or research experience: teaching experience will be a further recommendation.

Salary on the Burnham Scale: £1,550 x £50—£1,750 a year.

Further particulars and form of application, to be returned as quickly as possible, may be obtained by sending a stamped addressed foolscap envelope to the Principal of the College.

GEORGE TAYLOR,
Chief Education Officer.

Education Department,
Leeds 1. (S 514)

SOUTH OF SCOTLAND ELECTRICITY BOARD

Edinburgh and Borders Area

FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEERS

EDINBURGH DISTRICTS

SALARY: N.J.B., SCHEDULE A, CLASS G, GRADE 4, £1,350/£1,500 P.A.

APPLICATIONS on the standard form, obtainable from the undersigned or any other Area Manager, should be submitted not later than 25 Nov., 1960.

Applicants should preferably be Corporate Members or Graduates of the Institution of Electrical Engineers or possess equivalent qualifications and should have experience in domestic, commercial and industrial applications of electricity and a knowledge of installation work, tariffs, sales and all aspects of service to consumers.

Conditions of service will be in accordance with the National Joint Board Agreement for the Electricity Supply Industry. The successful candidates, subject to satisfactory evidence of health, will require to become contributors to the Board's Superannuation Scheme.

In each case the successful candidate will require to reside within a reasonable distance of the District Office.

C. H. A. COLLYNS,
Manager.

52 Melville St,
Edinburgh 3. (S 489)

CITY AND COUNTY OF BRISTOL EDUCATION COMMITTEE

Bristol Technical College, Ashley Down, Bristol 7

(Second Advertisement)

THE Governors invite applications from suitably qualified and experienced persons for post in the Engineering Department from 1 Jan., 1961:

ASSISTANT (GRADE B)

to teach mainly electrical installation subjects to students preparing for B and C Certificates of City and Guilds of London Institute. Ability to assist with electrical subjects of National Certificate courses an asset.

Salary: Burnham Technical Scale, Grade B, £700/£1,150 p.a. (with additions for training and graduate or equivalent qualification). Placing on scale dependent on previous approved teaching or industrial experience.

Application form (returnable at earliest possible date) and details from the Registrar. Please quote "BTC 60/1." (S 502)

AIR MINISTRY

require

ASSISTANT MECHANICAL AND ELECTRICAL ENGINEERS

FOR design construction and maintenance of installations on airfields, radar stations, missile bases, workshops and maintenance units for the R.A.F. at home and overseas as well as certain Civil Airports. Salary: £805 at 25 to £1,095 at 34 or over, thereafter rising to max. £1,260 with increase for London and slight decrease for country districts. Appointments long term with promotion and pension prospects. Five-day week with four weeks' two days' leave a year initially. Special allowances payable in addition to salary during overseas service.

Minimum qualifications and experience:

(i) (a) University degree or equiv. diploma in electrical and/or mechanical engineering with at least two years' apprenticeship: or

(b) Graduate or corporate member of I.E.E. with at least three years' apprenticeship: or

(c) Graduate or corporate member of I.Mech.E. appreciable electrical engineering experience with at least three years' apprenticeship: and

(ii) Have been employed for minimum of two years with well established engineering concern and gained wide experience in both electrical and mechanical engineering practice.

Applicants must be natural born British subjects between ages of 25 and 45. Forms from Ministry of Labour, Technical and Scientific Register (K), 26 King St, London S.W.1, quoting D.158/0A. (S 374)

CENTRAL ELECTRICITY GENERATING BOARD

NORTH EASTERN AND YORKSHIRE REGION

Yorkshire Division

FOURTH ASSISTANT ENGINEER (CONTROL) SYSTEM OPERATION DEPARTMENT BECCA HALL, NEAR LEEDS

APPLICATIONS are invited for the appointment as Fourth Assistant Engineer (Control) in the System Operation Department, Becca Hall, near Leeds.

Duties will include compilation of operation statistics and records and assisting with system load control. Power Station experience will be an advantage.

The salary for the appointment will be in accordance with the National Joint Board Agreement, Class BX, Grade 11 (£855/£1,165 per annum), plus a 10% allowance for shift duties with a minimum of £90 per annum, and will commence at a point commensurate with qualifications and experience.

Forms of application may be obtained from the Assistant Regional Secretary (Personnel), Central Electricity Generating Board, North Eastern and Yorkshire Region, 1 Whitehall Rd, Leeds 1, to whom they should be returned to arrive not later than 21 Nov., 1960. (S 509)

ADMINISTRATIVE COUNTY OF LEICESTER

ASSISTANT ELECTRICAL ENGINEER

£840/£1,145

ACCORDING to qualifications. Candidates should be in possession of the Higher National Certificate in Electrical Engineering and be capable of preparing schemes for electrical installations in all types of buildings. Lodging allowance and removal expenses may be paid to a married man. Apply to County Architect, 123 London Rd, Leicester, by Friday, 2 Dec., 1960. (S 513)

UGANDA ELECTRICITY BOARD

APPLICATIONS are invited for the post of

TECHNICAL INSTRUCTOR

at the Board's Training Centre adjacent to the Owen Falls Power Station at Jinja where the Board is implementing a comprehensive programme for the training of local people for posts of increasing responsibility within the organisation.

Uganda has a very pleasant climate and income tax is lower than in the United Kingdom. Passages for employee and family, partly furnished accommodation, medical and dental treatment all free. Five days' overseas leave for every completed month of service in East Africa, plus local leave. Normal tour of duty 24-36 months.

Candidates should be Corporate or Graduate Members of the Institution of Electrical Engineers or have technical qualifications leading to that status, or should possess a Higher National Certificate in Electrical Engineering. Preference will be given to candidates with previous teaching experience and appropriate practical background experience in the electricity supply industry.

Duties will include the teaching of subjects contained in the syllabuses of City and Guilds courses No. 52 (Electrical Engineering Practice), No. 57 (Electrical Technicians), and No. 58 (Electrical Fitters), by close co-ordination of activities with the Board's existing instructional staff.

Commencing salary depending upon qualifications and experience within the range £1,440/£1,740 per annum. In addition a monthly gratuity of 30% of salary will be paid.

Application forms and further information on Uganda and the Uganda Electricity Board may be obtained from the London Representative, Uganda Electricity Board, Uganda Hse, Trafalgar Sq, London W.C.2, to whom completed forms should be returned not later than 5 Dec., 1960.

E. H. WILSON,
Secretary.
(S 490)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2

THE EAST MIDLANDS ELECTRICITY BOARD

Lincolnshire Sub-Area

THIRD ASSISTANT DISTRICT ENGINEER
LINCOLN DISTRICT
Re-advertised Vacancy No. 5/60.

SALARY: N.J.B. Class F, Grade 9, £890/£1,015 per annum.

The duties of the post will be to assist in the planning, construction, operation and maintenance of underground and overhead systems up to and including 11 kV.

The successful candidate will be required to reside in or near the City of Lincoln and to undertake standby duty.

Applications giving details of age, present position and salary, qualifications and experience should be addressed to the Manager, Lincoln District, Brayford Side North, Lincoln, within 14 days of the date of this advertisement.

Lincolnshire Sub-Area

THIRD ASSISTANT DISTRICT ENGINEER
BOSTON DISTRICT
Re-advertised Vacancy No. 85/60.

Salary: N.J.B., Class F, Grade 9, £890 £1,015 per annum.

Candidates should have had practical experience of the operation and maintenance of Urban and Rural distribution systems up to 11 kV. The successful candidate will be required to undertake standby duties and to reside within the District.

Applications giving details of age, present position and salary, qualifications and experience should be addressed to the Manager, Lincolnshire Sub-Area, North Hse, Grantham, Lincs, within 14 days of the date of this advertisement.

Nottingham Sub-Area

SECOND ASSISTANT ENGINEER
(CONSTRUCTION)
Vacancy No. 120/60.

Salary: N.J.B., Class K, Grade 7, £1,350/£1,503 per annum.

The duties will include the progressing of schemes from the planning stage to complete commissioning of major 33 kV and 11 kV schemes (substations, underground and overhead lines), using both direct and contract labour. Ability to drive a car is desirable.

THIRD ASSISTANT ENGINEER
(CONSTRUCTION)
Vacancy No. 121/60.

Salary: N.J.B., Class K, Grade 10, £1,115/£1,245 per annum.

To assist in duties similar to the above post.

THIRD ASSISTANT ENGINEER
(PLANNING AND DEVELOPMENT)
Vacancy No. 122/60.

Salary: N.J.B., Class K, Grade 11, £1,040/£1,165 per annum.

The duties will include assisting with system planning and design up to and including 33 kV, the preparation of schemes for capital authorisation, technical reports, and the design of substation layouts and overhead lines. Ability to drive a car is desirable.

SECOND ASSISTANT DISTRICT ENGINEER
Vacancy No. 123/60.

Salary: N.J.B., Class E, Grade 7, £965/£1,090 per annum.

The duties will include responsibility for the construction, operation and maintenance of overhead and underground systems and substations up to and including 33 kV. Ability to drive a car is essential, and the successful applicant will be required to reside in the neighbourhood of the Caythorpe Depot (six miles east of Nottingham), and to undertake standby duty.

FOURTH ASSISTANT DISTRICT ENGINEER
Vacancy No. 124/60.

Salary: N.J.B., Class G, Grade 13, £715/£805 per annum.

The duties of this post will be to assist in the construction, operation and maintenance of distribution systems of all voltages up to 11 kV.

Applications for the above vacancies giving details of age, present position and salary, qualifications and experience should

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be addressed to the Manager, Nottingham Sub-Area, 35-39 Carrington St, Nottingham, within 14 days of the date of this advertisement.

Coventry Sub-Area

SENIOR ASSISTANT (PURCHASING)
Vacancy No. 125/60.

Salary: N.J.C., Grade 5, £1,020 × £30—£1,140 per annum.

The successful applicant will be responsible to the Sub-Area Secretary for all aspects of work in connection with purchasing, records, returns and statistics, including correspondence of the Sub-Area Purchasing Section.

Applicants should be conversant with all classes of stores and equipment associated with the Electricity Supply Industry, and should be capable of working on their own initiative.

Applications giving details of age, present position and salary, qualifications and experience should be addressed to the Manager, Coventry Sub-Area, Sandy La, Coventry, within 14 days of the date of this advertisement. (S 540)

EASTERN ELECTRICITY BOARD

Fens Sub-Area

ELECTRICIANS
(299/60R.)

VACANCIES for electricians are occurring in the Wisbech and Peterborough Areas. Applicants should be skilled craftsmen experienced in domestic, commercial and industrial installations.

Rates and conditions in accordance with the National Joint Industrial Council Agreement for the Electricity Supply Industry, the present rate being 5s 6½d per hour for a 42-hour, five-day week.

Apply by letter to the Secretarial Officer, Fens Sub-Area, Eastern Electricity Board, Milton Hall, Milton, Cambridge, by 25 Nov., 1960. (S 533)

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Division

CROYDON "B" POWER STATION

APPLICATIONS are invited for the following positions:

ELECTRICAL MAINTENANCE ENGINEER
Vacancy No. 227/60T.

Applicants should have had experience in the maintenance of heavy electrical plant and switchgear and should possess H.N.C. in Electrical Engineering (Power). Experience in the control of labour is essential. Applicants should also be capable of carrying out budgetary control and setting out specifications for electrical plant as required.

Salary: N.J.B., Class J, Grade 7, £1,325/£1,460 per annum, including London Allowance.

ASSISTANT ELECTRICAL MAINTENANCE ENGINEER
Vacancy No. 228/60T.

Applicants should have had experience with the maintenance of heavy electrical plant, together with a knowledge of electrical testing, schematic circuits and protection systems and should possess H.N.C. in Electrical Engineering (Power). Experience of labour control is essential.

Salary: N.J.B., Class J, Grade 9, £1,165/£1,295 per annum, including London Allowance.

ASSISTANT MECHANICAL MAINTENANCE ENGINEER
Vacancy No. 229/60T.

Applicants should have had experience with the maintenance of large boilers, turbines and auxiliary plant and should hold H.N.C. (Mechanical) or other suitable technical qualification. Experience of labour control is essential.

Salary: N.J.B., Class J, Grade 9, £1,165/£1,295 per annum, including London Allowance.

Applications, giving age, details of experience, qualifications, etc., should be sent to the Station Superintendent, Croydon "B" Power Station, Beddington Farm Rd, Croydon, to arrive by 23 Nov., 1960. (S 524)

CENTRAL ELECTRICITY GENERATING BOARD

South Western Division

ASSISTANT ENGINEER
(ELECTRICAL MAINTENANCE)
Vacancy No. ET/AV/158/60.

REQUIRED at Plymouth "B" Power Station.

Superannuation Scheme. Salary: N.J.B. Class J, Grade 8, Scale 10, £1,190/£1,325 per annum.

Preference will be given to candidates who hold the Higher National Certificate in Electrical Engineering and have had experience with maintenance of H.V. and L.V., switchgear and motors.

Closing date: 25 Nov., 1960.

SHIFT CONTROL ENGINEER
Vacancy No. ET/AV/160/60.

Required at Newton Abbot Power Station.

Superannuation Scheme. Salary: N.J.B. Class F, Grade 10, Scale 5, £825/£940 per annum plus 10% shift allowance (minimum of £90 per annum).

Candidates should possess good qualifications and have had training and experience in the control and operation of steam generating plant and main switchgear.

Closing date: 18 Nov., 1960.

Applications on Form AE6/ACT obtainable from the Divisional Secretary, 26 Oakfield Rd, Bristol 8, should be completed and returned by the date stated. (S 526)

YORKSHIRE ELECTRICITY BOARD

No. 5 (Wakefield) Sub-Area

WAKEFIELD DISTRICT
THIRD ASSISTANT DISTRICT ENGINEER

APPLICANTS should have had a sound practical training and some experience in the construction, operation and maintenance of H.V. and M.V. overhead and underground distribution networks, substation plant and ancillary equipment.

The post will be based on the Wakefield Unit of the Wakefield District, and candidates must be prepared to reside in the District and undertake stand-by duties.

Candidates must possess a Higher National Certificate in Electrical Engineering or equivalent technical qualifications.

Salary: N.J.B. Class H, Grade 9 (Scale 8), £1,040/£1,165 per annum.

Sub-Area Headquarters

SENIOR ASSISTANT
(ACCOUNTANCY, COSTING AND STORES)

Candidates should have had sound costing experience and be capable of initiating and carrying out instructions without immediate supervision, and will be required to assist the Principal Assistant responsible for the Section with much of the detailed supervisory work. The possession of an accountancy qualification will be an advantage.

Salary: N.J.C. Grade 4, £890 x £30—£1,010 per annum.

Applications, together with the names of two referees, should be sent to the Manager, Yorkshire Electricity Board, No. 5 (Wakefield) Sub-Area, 1a Denby Dale Rd, Wakefield, not later than 25 Nov., 1960.

No. 7 (Grimsby) Sub-Area

GRIMSBY DISTRICT (LOUTH)
THIRD ASSISTANT ENGINEER

Applicants should be of Higher National Certificate standard in Electrical Engineering and have experience in the design, construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems, substation plant and ancillary equipment.

Salary: N.J.B. Class H, Grade 9 (Scale 8), £1,040/£1,165 per annum.

Scunthorpe District

CONSUMERS' ENGINEER
(GENERAL DEVELOPMENT)

Applicants should have had wide experience of the Commercial activities within the Electricity Supply Industry. Technical qualifications would be an advantage.

Salary: N.J.B. Class G, Grade 8 (Scale 8), £1,040/£1,165 per annum.

Applications, together with the names of two referees, should be sent to the Manager, Yorkshire Electricity Board, No. 7 (Grimsby) Sub-Area, Moss Rd, Grimsby, not later than 25 Nov., 1960. (S 537)

CENTRAL ELECTRICITY GENERATING BOARD

London Division

APPLICATIONS invited for the following superannuable post. Conditions of service in accordance with N.J.B. Agreement, Schedule B. Salary includes London Allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. an advantage.

FOURTH ASSISTANT ENGINEER
(DRAWING OFFICE)
CONSTRUCTION SECTION
GENERATION DEPARTMENT
DIVISIONAL HEADQUARTERS
GENERATION HOUSE
Vacancy No. 60/907.

Candidates should have had a good technical education and possess the Ordinary National Certificate or equivalent. Experience in layout of indoor and outdoor 132 kV substations is essential for work on transmission schemes. Some experience of the preparation of multicore cable schedules and layout, together with schematic and wiring diagrams would be an advantage. Salary: Class BX, Grade 11: from 1 July, 1960, £905/£1,215 per annum; from 1 July, 1961, £950/£1,215 per annum.

Applications, quoting vacancy no. to (or on form from) Personnel Officer, Central Electricity Generating Board, London Division, P.O. Box 136, London W.1, by 22 Nov., 1960. (S 500)

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Chilterns Sub-Area

LUTON DISTRICT
FOURTH ASSISTANT ENGINEER
295/60R.

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems, including substations. Salary: N.J.B., Class J, Grade 11 (£965/£1,090).

Apply by letter to the Manager, Luton District, Eastern Electricity Board, 487 Dunstable Rd, Luton, by 25 Nov., 1960.

Essex Sub-Area

SUB-AREA HEADQUARTERS, NEAR BRENTWOOD
FOURTH ASSISTANT ENGINEER (CONTROL)
296/60R.

Candidates should have had a sound technical training and experience in the construction, operation and maintenance of overhead and underground distribution systems. A knowledge of system protection is desirable.

Salary: N.J.B., Class L, Grade 13, Scale 7 (£965/£1,090), plus London Allowance, plus a shift allowance of 10%.

Apply by letter to G. M. Holland, M.I.E.E., A.M.B.I.M., Engineer, Essex Sub-Area, Eastern Electricity Board, "Millfield", Bentley, Nr. Brentwood, Essex, by 25 Nov., 1960.

Fens Sub-Area

SUB-AREA HEADQUARTERS, MILTON, CAMBRIDGE
FOURTH ASSISTANT ENGINEER
(PLANNING AND DEVELOPMENT)
297/60R.

The work involves assistance in the planning of schemes at L.V. and 11 kV over the whole Sub-Area and participating in the planning of extensions to the 33 kV system. A good background of technical training in Distribution with qualifications of Grad. I.E.E. standard is desirable, together with some knowledge of the preparation of switchgear specifications. The position offers an excellent opportunity for obtaining experience over a wide field of planning work.

Salary: N.J.B., Class K, Grade 12 (£965/£1,090).

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Apply by letter to F. C. Orchard, J.P., M.I.E.E., A.M.I.MECH.E., M.I.B.A.E., Manager, Fens Sub-Area, Eastern Electricity Board, Milton Hall, Milton, Cambridge, by 25 Nov., 1960.

Northmet Sub-Area

SUB-AREA HEADQUARTERS, SOUTHGATE, N.14
FOURTH ASSISTANT ENGINEER
(OPERATION AND MAINTENANCE)
298/60R. (Ref. 1013)

Applicants should be qualified and experienced in the maintenance of distribution plant on systems of 33 kV and below, and be capable of co-ordinating maintenance programmes, advising on methods and investigating faults.

Salary: N.J.B., Class N, Grade 12 (£1,240/£1,375) inclusive of London Allowance.

CLERK OF WORKS—CIVIL ENGINEERING AND BUILDING SECTION
(Ref. 957)

Candidates should have had a good general and technical education, possess a sound knowledge of practical building and civil engineering construction and be capable of setting out and supervising works in the course of construction.

Salary: N.J.B., Class N, Grade 16, (£940/£1,065) inclusive of London Allowance.

For these appointments apply by letter to the Manager, Eastern Electricity Board, Northmet Sub-Area, Northmet Hse, Cannon Hill, Southgate, London N.14, by 21 Nov., 1960. (S 539)

City and County of Norwich

ASSISTANT ELECTRICAL ENGINEER

REQUIRED. Salary: APT Grade IV, £1,140/£1,310 with casual car allowance, according to experience and qualifications. Applicants must have the Higher National Certificate or be Graduates of the Institution of Electrical Engineers, have served an apprenticeship in electrical installation work and have had experience in the design and supervision of street lighting, and interior lighting and power installations.

Applicants should state age, qualifications, training, experience, present and previous positions, giving salaries and dates, together with names of three referees.

Applications to the City Engineer, City Hall, Norwich, NOR 01A, by 24 Nov., 1960. (S 527)

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Project Group

APPLICATIONS are invited for the appointment of
SECOND ASSISTANT ENGINEER
(PROGRESS)
in the Midlands Project Group at Rugeley Power Station site.

Applicants should preferably possess a Higher National Certificate in either Mechanical and Electrical Engineering and have served a recognised engineering apprenticeship. Experience in the construction of heavy plant as installed in modern power stations, either in a manufacturers' works or on site, is essential and a knowledge of the civil engineering work involved would be an advantage.

The selected candidate will be required to maintain up-to-date charts on the progress of the works on site in accordance with previously agreed programmes, and to assist the Resident Engineer in anticipating any divergence from these programmes. Ability to co-ordinate with Regional P.I.T. Officers will be required.

The salary will be within Grade 5, Scale 15, £1,400/£1,830 per annum of the National Joint Board Agreement.

Applications should be made on standard form AE.6 available from the Administrative Officer, Midlands Project Group, P.O. Box 314, Birmingham 30, and should be returned to him not later than 23 Nov., 1960.

Envelopes should be marked "Confidential Staff Vacancy Notice No. MPG.78/60." (S 510)

SOUTHERN ELECTRICITY BOARD

ASSISTANT ENGINEER (PLANNING)
(Z.1280)

READING District of No. 2 (Newbury) Sub-Area. Salary: N.J.B. Class J, Grade 9 (£1,115/£1,245 per annum). N.J.B. Conditions of Service.

The duties of the post will be to assist the Planning Engineer in the preparation of schemes and estimates for extensions of and reinforcement to overhead and underground H.V. and L.V. networks, and to undertake standby duties, if required. Applicants should possess suitable technical qualifications.

ASSISTANT ENGINEER
(MAINTENANCE AND OPERATION)
(Z.1279)

Reading District of No. 2 (Newbury) Sub-Area. Salary: N.J.B. Class J, Grade 11 (£965/£1,090 per annum). N.J.B. Conditions of Service.

The duties of the post will be to assist with the maintenance and operation of H.V. and L.V. distribution mains and substations and with minor construction work. A technical training to H.N.C. standard and experience of similar work are required.

Applications for both appointments on forms obtainable from the Sub-Area Secretary, 7 Oxford Rd, Newbury, Berks, and returned to him, quoting the appropriate "Z" number, not later than 21 Nov., 1960.

DEMONSTRATOR

Basingstoke District of No. 3 (Portsmouth) Sub-Area. Salary: N.J.C. Grade 1 (£600/£700 per annum). N.J.C. Conditions of Service.

Applicants should be qualified to advise generally on the utilisation of electric domestic appliances, to give public demonstrations of apparatus and to assist in showroom duties. The possession of an E.A.W. Certificate or equivalent Domestic Science qualification would be an advantage.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton La, Cosham, Portsmouth, and returned to him, quoting Z.1281, not later than 21 Nov., 1960.

The successful candidates for the above appointments will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible. (S 536)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

North Caledonia Area

APPLICATIONS are invited for the post of
THIRD ASSISTANT ENGINEER
(OPERATIONS AND MAINTENANCE)
for duty with a maintenance squad at Fort Augustus, Inverness-shire. Experience in the construction and maintenance of overhead lines is required, and preferably tower lines. Technical qualifications an advantage. Salary and conditions in accordance with N.J.B. Schedule, Class G, Grade 9, £965 x £25—£1,090 per annum.

Application form obtainable from Area Manager, West Villa, South St, Elgin, should be returned by 28 Nov., 1960. (S 530)

CENTRAL ELECTRICITY GENERATING BOARD

Southern Division

GRADE TEN ENGINEER
POOLE GENERATING STATION
(SEC/3.114.)

THE successful applicant will be given the opportunity of gaining experience in oil-fired plant operation, control room duties and maintenance work. Operating experience of modern generating station plant is essential.

Preference will be given to those possessing qualifications leading to corporate membership of a recognised professional institution or equivalent qualifications.

Salary: N.J.B. Grade K/10, Scale 9, £1,115/£1,245.

Special application forms (not AE6/ACT) obtainable only from Divisional Secretary, 111 High St, Portsmouth, should be returned by 22 Nov., 1960. (S 534)

CENTRAL ELECTRICITY GENERATING BOARD
Eastern Division

APPLICATIONS are invited for the following appointment:

GENERAL ASSISTANT ENGINEER
NORWICH GENERATING STATION
Staff Vacancy No. 1403.

Salary: N.J.B., Class F, within the range of Grades 14/13, Scales 1/2, £625/£750 per annum, plus 10% Shift Allowance when required to work on shift.

The duties of the successful applicant will include assisting in the Control Room on shift and other operation and investigation duties.

The commencing salary will depend upon qualifications and the duties and responsibilities of the post offered.

Preference will be given to applicants who have had previous experience in a generating station and who have reached the standard of the Ordinary National Certificate in Electrical Engineering or its equivalent.

Applications, quoting Staff Vacancy No. 1403, stating age, qualifications, experience and present position, should be sent to the Controller, Central Electricity Generating Board, Eastern Division, West Farm Pl, Chalk La, Cockfosters, Barnet, Herts, by 19 Nov., 1960. (S 499)

THE SOUTH WALES ELECTRICITY BOARD
Assistant Engineers

APPLICATIONS are invited for the following positions in the Mid-Wales and North Monmouthshire District (Brecon) in the Monmouthshire and Mid-Wales Area of the Board:

(A) GENERAL ASSISTANT ENGINEER
Salary: N.J.B. Class E, Grade 9, Scale 5, £825/£940 per annum.

(B) GENERAL ASSISTANT ENGINEER
Salary: N.J.B. Class E, Grade 10, Scale 4, £765/£870 per annum.

The successful applicants will be employed on planning, operational and constructional duties within this extensive rural district of 1,180 square miles, and will obtain considerable experience in the development of a rural supply network.

Applications stating age, present position, present salary, qualifications and experience should be addressed to D. G. Gwyn, B.SC., A.M.I.E.E., Manager, Monmouthshire and Mid-Wales Area, Llywelyn Rd, Cwmbran, to arrive not later than Saturday, 26 Nov., 1960.

Please quote reference (a) 69/60/ET or (b) 203/60/ET, endorsing envelope "Assistant Engineer."

R. G. WILLIAMS,
Secretary.
(S 525)

THE NORTH EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointment:

Wear Sub-Area

SENIOR DEMONSTRATOR AT SUNDERLAND

Applicants should have a certificate of a recognised Domestic Training College and/or E.A.W. certificate, preferably the latter; also considerable experience as a Demonstrator in the Electricity Supply Industry.

Salary: Grade 2, £700/£775, according to qualifications and experience. N.J.C. conditions.

Applications stating age, qualifications and experience to be received by Assistant Secretary (Establishments), The North Eastern Electricity Board, G.P.O. Box No. 117, Carliol Hse, Newcastle upon Tyne, within ten days of the appearance of this advertisement. (S 544)

CENTRAL ELECTRICITY GENERATING BOARD
Midlands Division

APPLICATIONS are invited for the position of

FOURTH ASSISTANT ENGINEER

in the Testing Section of the Department of the Chief Generation Engineer. This is a superannuable appointment under N.J.B. service conditions, commencing salary within Grade 11, BX-8 under Schedule B of the agreement covering the range 855/£1,165.

This post, which is primarily concerned with the efficiency of all mechanical and some electrical plant in the Power Stations of the Division, should appeal to any man with a clear analytical mind. Applicants should possess suitable engineering qualifications, and experience in efficiency testing will be advantageous.

Apply quoting Vacancy No. 304/60MD form AE6 available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, not later than 21 Nov., 1960. (S 532)

CENTRAL ELECTRICITY GENERATING BOARD
East Midlands Division

ASSISTANT SHIFT CHARGE ENGINEER
DRAKELOW "B" POWER STATION
Vacancy No. 252/60.

APPLICATIONS are invited for the position of Assistant Shift Charge Engineer at Drakelow "B" Power Station, nr. Burton-on-Trent, Staffs.

Applicants should have received a sound technical training and have had experience in a modern power station. Preference will be given to candidates who possess the Higher National Certificate, or its equivalent.

Salary will be in accordance with Class L, Grade 8 (£1,350/£1,500 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications: 19 Nov., 1960.

GENERAL ASSISTANT ENGINEER
DERBY POWER STATION
Vacancy No. 253/60.

Applications are invited for the position of General Assistant Engineer at Derby Power Station, Full St, Derby.

Candidates should be suitably qualified young men who are interested in power station operation and/or maintenance as a career.

Facilities are available whereby experience can be obtained in all sections of a modern power station, and the prospects of advancement are real to those who are willing to take advantage of the opportunities.

The salary during the initial training period will depend upon qualifications and knowledge, and will be within the range £625/£805 per annum of the National Joint Board Agreement.

Closing date for receipt of applications: 26 Nov., 1960.

These appointments will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Station Superintendent concerned and should be returned to him by the date stated.

O. S. WOODS,
Divisional Controller.

THIRD ASSISTANT ENGINEER
TECHNICAL DEPARTMENT
DIVISIONAL HEADQUARTERS
Vacancy No. 251/60.

Applications are invited for the position of Third Assistant Engineer in the Technical Department at Divisional Headquarters, Nottingham.

The minimum technical qualification desired is the Higher National Certificate in Electrical Engineering, and preference will be given to candidates who have completed a recognised post graduate apprenticeship.

Experience in the commissioning of high-voltage switchgear and protective gear is essential. Experience in the associated contract engineering work is desirable.

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Salary will be in accordance with Class BX, Grade 6 (£1,285/£1,610 per annum) of the National Joint Board Agreement, and the position will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, P.O. Box 25, Barker Gate, Nottingham, and should be returned to him not later than 19 Nov., 1960.

O. S. WOODS,
Divisional Controller.
3 Nov., 1960. (S 538)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:

Birmingham & District Sub-Area

SECOND ASSISTANT DISTRICT ENGINEER
(SUTTON COLDFIELD AND NORTH EAST DISTRICT)

Extensive experience necessary with High Voltage, Medium Voltage and Protective Systems. Applicants should have technical qualifications commensurate with eligibility for Associate Membership of the I.E.E. Salary: £1,350/£1,500 per annum (N.J.B., Grade K.7). Apply, by letter, within 14 days, stating age, experience, qualifications, present position and salary to Emil Braathen, Sub-Area Manager, Midlands Electricity Board, 14 Dale End, Birmingham 4.

Shropshire & Herefordshire Sub-Area

FIRST ASSISTANT (LUDLOW)

The successful applicant will be required for Sales Promotion Duties, and should have a sound commercial experience including a thorough knowledge of modern sales methods and techniques, and should be capable of organising sales campaigns and promotion activities designed to develop the sale of electrical appliances. Duties will include the supervision of Service Centres, Demonstrators and outside Sales Representatives. Appropriate qualifications desirable. Salary: £1,040/£1,165 per annum (N.J.B., Grade E.6). Apply, by letter, within 14 days, stating age, qualifications, experience, present position and salary to Mr H. Winwood, Sub-Area Manager, Midlands Electricity Board, Spring Gdns, Ditherington, Shrewsbury.

Wolverhampton & District Sub-Area

GENERAL ASSISTANT DISTRICT ENGINEER
(CANNOCK)

Applicants should have suitable technical qualifications and training in engineering duties associated with electricity distribution systems. Salary: £765/£870 per annum (N.J.B., Grade F.11). Apply, by letter, within 14 days, stating age, experience, present position and salary to Mr D. Holt, Sub-Area Manager, Midlands Electricity Board, 83 Darlington St, Wolverhampton.

Worcester & District Sub-Area

SECOND ASSISTANT DISTRICT ENGINEER
(EVESHAM)

Experience necessary in all Branches of distribution work including construction, maintenance and operation of high and low voltage underground and overhead systems and substations. Technical qualifications desirable. Salary: £1,040/£1,165 per annum (N.J.B., Grade F.7). Apply, by letter, within 14 days, stating age, experience, present position and salary to Mr J. Johnston, District Manager, Midlands Electricity Board, 64 High St, Evesham.

SECOND ASSISTANT DISTRICT
COMMERCIAL ENGINEER
(WORCESTER AND MALVERN DISTRICT)

Applicants should have had experience in the industrial and domestic aspects of commercial work, including installations and sales and service to the consumer. Technical qualifications desirable. Salary: £965/£1,090 per annum (N.J.B., Grade F.8). Apply, by letter, within 14 days, stating age, experience, present position and salary to Mr E. C. Watson, District Manager, Midlands Electricity Board, P.O. Box No. 16, Blackpole Rd, Worcester.

F. W. CATER,
Secretary.
(S 512)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

SENIOR SERVICE CENTRE ASSISTANT

REQUIRED at Whitchurch. Salary within range £600/£700 per annum (N.J.C. Grade 1).

Applicants should have a sound knowledge of modern electrical appliances and of the electrical retail trade. Duties will include responsibility for the Service Centre, sales of appliances, advice to consumers, window display and receipt of accounts.

Appointment subject to medical examination. Pension Scheme.

Standard application forms obtainable from the Manager, No. 4 Sub-Area, Electricity Hse, Rhostyllen, nr. Wrexham, or from any District Office. Closing date: 21 Nov., 1960. (S 531)

CONSULTING ENGINEERS require ASSISTANT ELECTRICAL ENGINEERS graduates with three/four years suitable experience on E.H.V. Transmission for (a) Contract Engineer, Weybridge, Surrey. (b) Site Supervision, North West England. Ref.: CMM. Kennedy Donkin, 12 Caxton St, Westminster, S.W.1. (S 488)

ADMIRALTY—NAVY WORKS DEPARTMENT

ELECTRICAL AND MECHANICAL ENGINEERING DRAUGHTSMEN

Vacancies exist in Navy Works Department Drawing Offices as shown below and occur at Establishments elsewhere in United Kingdom from time to time.

The posts are non-pensionable but there will be opportunities for transfer to the Established staff.

Applicants must be competent Draughtsmen and experienced in one or more of the following types of work:

Electrical (Vacancies at Pinner (Middx.), Portland and Devonport).

(a) Preparation of specifications, drawings and schedules for electrical equipment. Précis of Firms tenders.
(b) Electrical installations in domestic and industrial buildings.
(c) Cable installations, switchgear, etc.
(d) Airfield lighting.

Mechanical (Vacancies at Pinner (Middx.), Portsmouth, Portland, Liverpool, Rosyth, London).

(a) Preparation of specifications, drawings, schedules and précis of Firms tenders.
(b) District heating, including boiler installations, heating and air conditioning of domestic and specialist buildings.
(c) Layouts of engineering installations and workshop machinery.
(d) All classes of lifting appliances, pumping installations, test plants, cooking equipment, etc.

Possession of O.N.C. or similar qualification will be an advantage. Consideration will be given to successful candidates being granted assistance to obtain technical qualifications.

Salary (Men): National Rate—subject to slight variation dependent on location: starting from £580 (at age 21) to £870 (28 and over); maximum of scale: £955 p.a. (National Rate).

Opportunities occur for promotion to Leading grade—salary maximum: £1,115 p.a. (National Rate).

Five-day week. Annual leave 18 days, rising to 22 after 10 years.

Candidates, who must be British subjects, are invited to apply in writing, giving details of qualifications and experience to Director General, Navy Works, Admiralty, Chamberlain Way, Pinner, Middlesex. (S 435)

THE LUMMUS COMPANY LIMITED
IMPERIAL HOUSE
80 Regent Street, London, W.1.

Designing Engineers and Constructors to the Petroleum and Chemical Industry invite applications for an

ELECTRICAL ENGINEER

for the position of

SECTION LEADER

in charge of the Electrical Department.

The position is in charge of approximately 20-30 Electrical Engineers and Draughtsmen and allied technical personnel. The major responsibility is the direction of these personnel engaged in preparing specifications, designs, and material requisitions for all electrical work associated with the Company's work.

Applicants should be 35 years of age or over, and preferably have an Honours Degree in Electrical Engineering or A.M.I.E.E. and have experience of leadership.

Salary will be in accordance with qualifications, and will be higher than £1,800 per annum.

Liberal sickness and pension schemes are provided.

Reply in writing to the Personnel Department. (S 515)

BRITISH Engine Boiler and Electrical Insurance Co. Ltd., Longridge Hse, Manchester 4. ELECTRICAL SURVEYOR required in Scotland, also Manchester. Permanent position carrying progressive salary scale £800/£1,100 and non-contributory pension. Candidates aged 26 to 32, with H.N.C. in Electrical Engineering or Grad. I.E.E and with apprenticeship in manufacture or repair of electrical machinery, are invited to apply stating age, qualifications and experience. (S 543)

ELECTRICAL DRAUGHTSMAN required in Southampton Docks for layout of lighting, heating and power installations. Knowledge of mains work and street lighting an advantage. Salary scale: £475/£835 according to age. Permanent appointment after satisfactory probationary period. Superannuation and travel facilities. Write, giving full details of training qualifications and experience, to Chief Docks Engineer (Mechanical and Electrical Section), British Transport Docks, Southampton Docks. (S 504)

ELECTRICAL DRAUGHTSMAN

AN EXPERIENCED ELECTRICAL DRAUGHTSMAN is required for the Central Engineering and Planning Department, Pilkington Brothers Ltd., to work with the Electrical Project Engineer on layouts and circuitry of major heavy electrical engineering installations.

Applicants, who should have had previous experience, will be required to design circuits under the supervision of a Chartered Electrical Engineer and to check contractors' work from time to time.

Applications should be addressed to Mr W. B. ROXBURGH, Group Chief Engineer, Pilkington Brothers Ltd., St. Helens, Lancashire. (S 507)

CABLE ENGINEER required at works in S.E. London to assist in the design of super tension, including oil-filled cables. Previous experience in this field is desirable and applicants should be of at least H.N.C. standard. Good salary according to qualifications and experience in a position that offers excellent prospects in an expanding organisation.

Please write with full details to Box 8063, Electrical Times. (S 453)

DESIGN ENGINEER required for Consulting Engineer's Office to undertake the design of electrical services for all classes of buildings, including hospitals, industrial and commercial buildings, at home and abroad. Spring and summer holidays. Pension scheme and luncheon vouchers. Apply in writing, stating age, experience, present salary and salary required to: J. Roger Preston and Partners, 15 North Audley St, London W.1. (S 483)

ELECTRICAL ENGINEER required, to take charge of Motor rewind and Transformer Manufacturing dept of large engineering company, situated near Wolverhampton.—Box 8065, Electrical Times. (S 516)

BICC

British Insulated Callender's Construction Co. Ltd., have vacancies in their Overhead Line Contracts Department in London for

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The work involves the preparation of arrangement and detailed drawings for Electrical Transmission and Distribution Lines. The posts offer advancement to the status of Designer Draughtsman.

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BIC Construction Co. Ltd.,
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London W.C.2.

(S 519)

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required at Dounreay Experimental Reactor Establishment to be responsible for the installation and maintenance of electrical plant associated with Reactors and Chemical Plant.

Applicants must have served a recognised engineering apprenticeship or pupilage and be at least Graduate I.E.E. or have equivalent qualification.

Rate of Pay: £860 (at age 25) to £1,340, according to age and experience.

Housing Assistance Schemes. Hostel accommodation.

Contributory Superannuation.

Send post-card for application form to Personnel Manager, U.K.A.E.A., Dounreay Experimental Reactor Establishment, Thurso, Caithness, quoting ref. 159/49.

(S 496)

ELECTRICAL ENGINEER required for Glasgow Office staff, age 23-28. Applicants (H.N.C. minimum) should have had experience in the manufacture of electrical machines. Progressive salary with non-contributory pension. Applications stating age, nationality, qualifications and experience to British Engine Boiler and Electrical Insurance Co. Ltd., 98 West George St, Glasgow C.2. (S 542)

ELECTRICAL DRAUGHTSMAN required for Consulting Engineer's Office to assist in the preparation and design of electrical services for all classes of buildings, including hospitals, industrial and commercial buildings, at home and abroad. Spring and summer holidays. Pension scheme and luncheon vouchers. Apply in writing, stating age, experience, present salary and salary required to: J. Roger Preston and Partners, 15 North Audley St, London W.1. (S 484)

SALES ENGINEER. Applications are invited from candidates of H.N.C. standard and with sales experience of H.V. and L.V. switchgear, variable speed drives, and rectifiers for our Ipswich Office staff. The appointment is pensionable and a Company car will be provided. Write in strict confidence to The Manager, Lancashire Dynamo Group Sales Ltd., 12 Princes St, Ipswich, giving details of age, education and training, qualifications and experience. (S 422)

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With experience in design and testing I.V. Control Gear.

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(S 378)

J. & P.

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two or three senior men required for development work on metalclad switchgear.

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The successful applicant should be not less than 25 years of age and have had general experience in testing, commissioning and maintaining of electronic and light current devices and control circuits associated with the control of processes as applied to heavy industrial and mining requirements.

He must also be capable of developing, as and when the need arises, new electronic and light current control devices with a minimum of supervision, and be capable of applying and commissioning such developments for use in heavy industrial and mining work.

Salary will be commensurate with qualifications and experience, but in any event will not be less than £141 1s 6d per month, plus a variable cost of living allowance which at present is approximately £5 per month.

Conditions of employment include married/single accommodation at subeconomic rental, medical scheme, pension and life assurance schemes and participation in the metal bonus scheme, which at present is approximately 30% of annual earnings.

Applications in writing, stating qualifications, experience, age and marital status should be addressed by air mail to:

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P.O. Box 2000,
Kitwe,
Northern Rhodesia.

(S 436)

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are required by

ENGLISH ELECTRIC

BRADFORD

for work in the design office on the applications of transistors to aircraft electrical power systems. (Applicants must be of degree or H.N.C. standard.) Previous experience on related work is essential—men with experience on semi-conductor devices, control systems, G.W. systems, either in industry or the Services will be considered. Prospects for advancement are good. Housing assistance may be offered in certain cases.

Please write in confidence to Dept. G.P.S., English Electric Hse, Strand, London W.C.2, giving full details of qualifications and experience and quoting reference ET 206A.

(S 505)

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(S 506)

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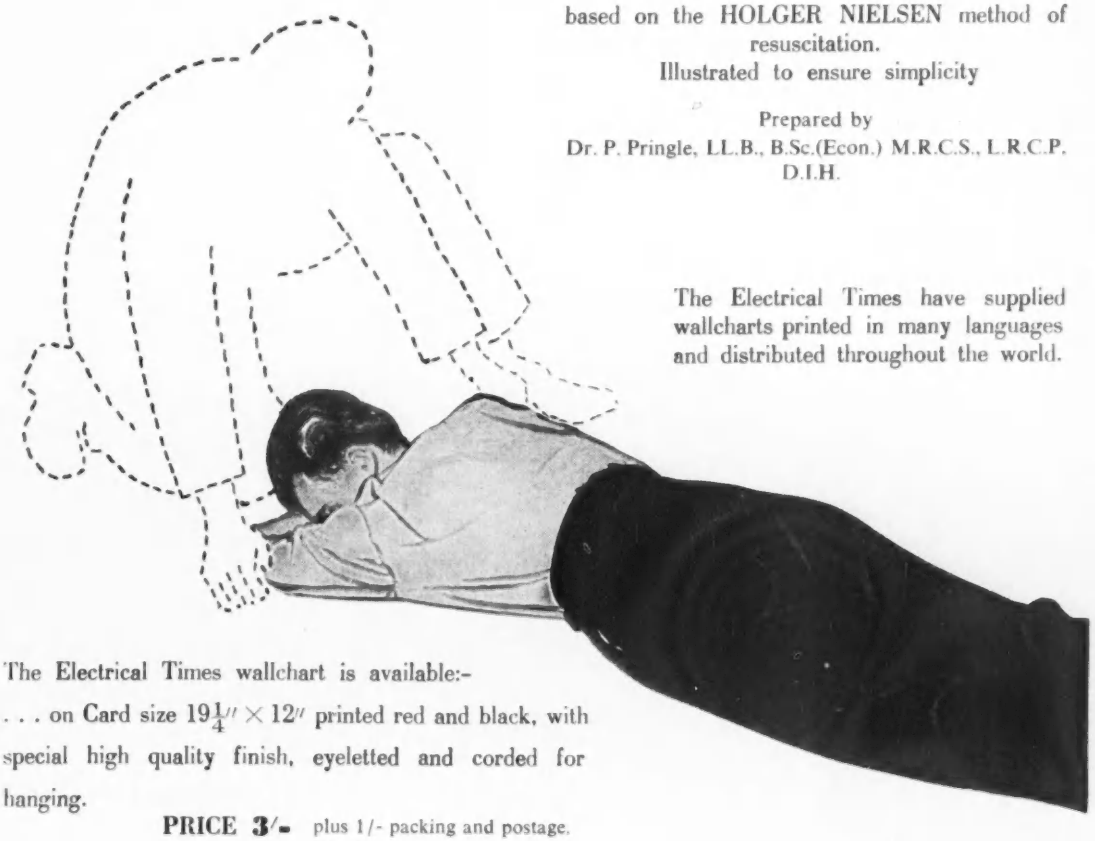

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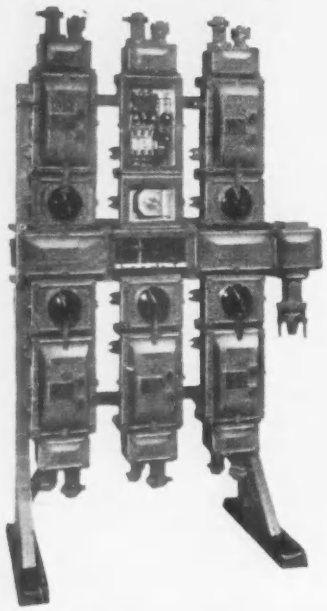

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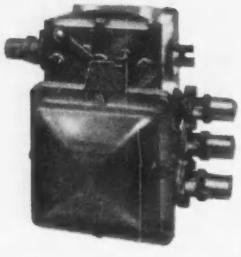

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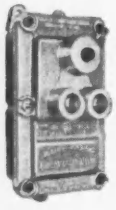

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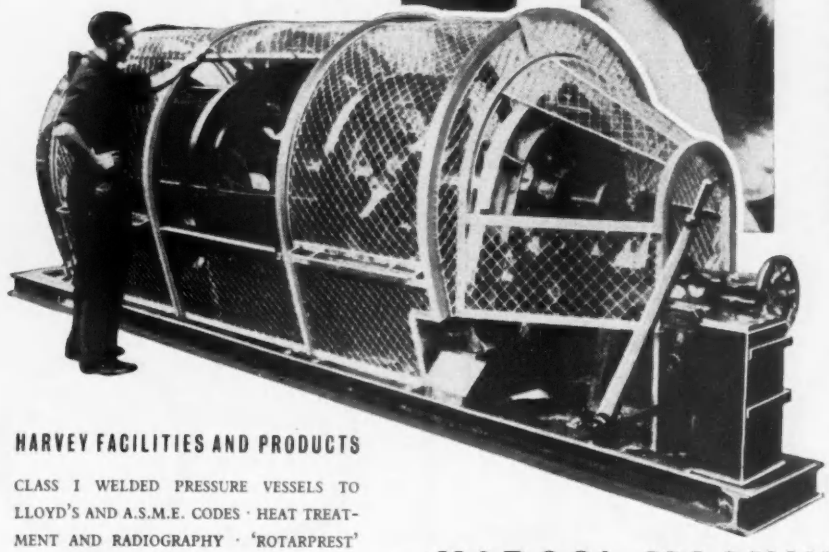

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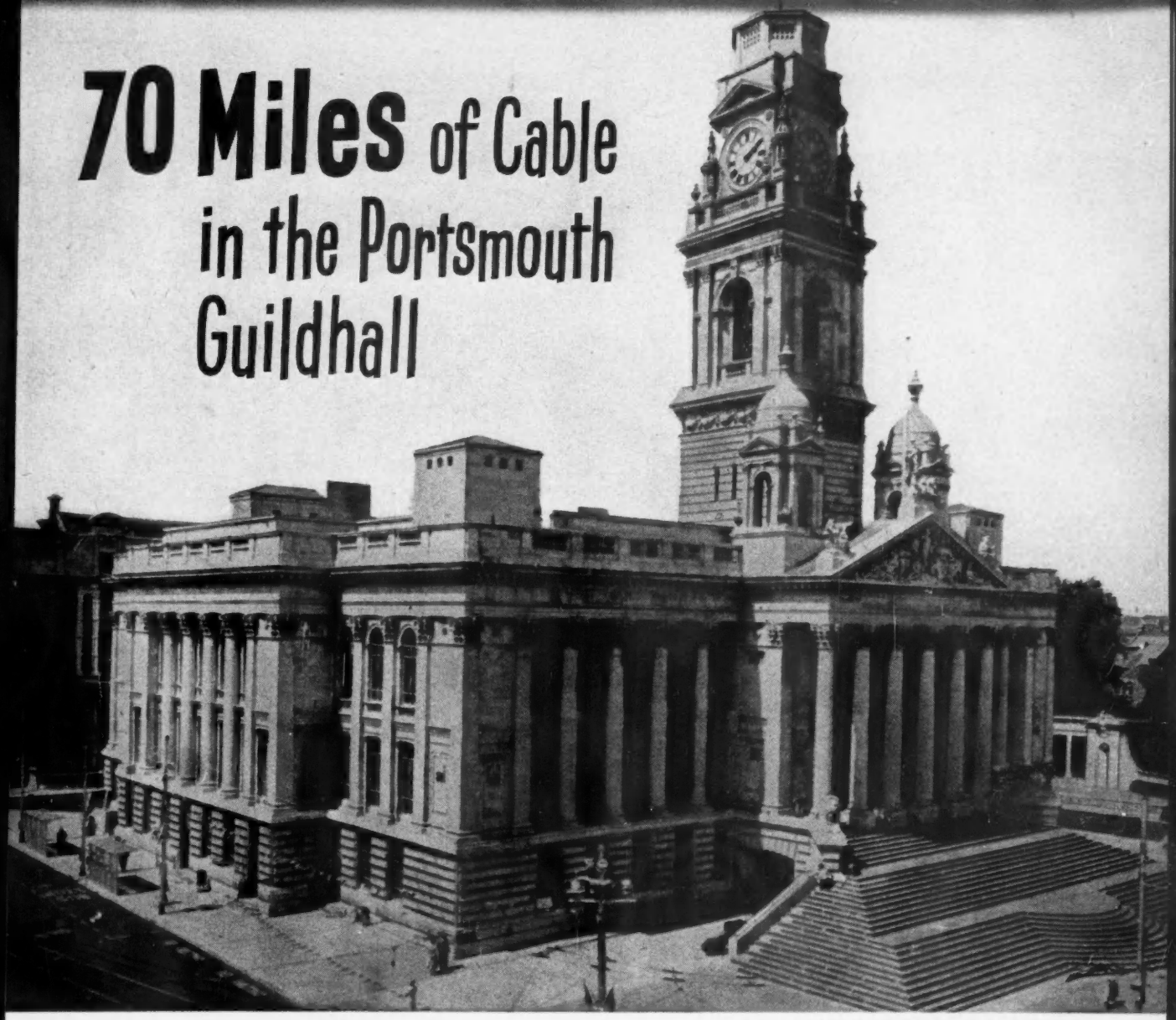

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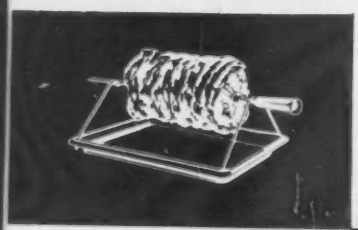

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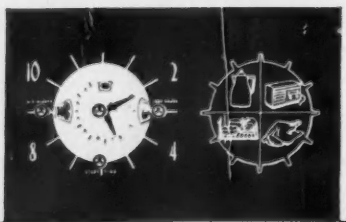

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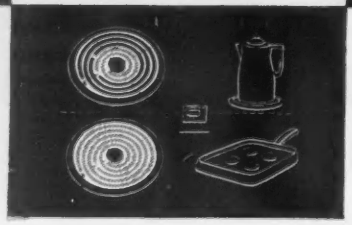

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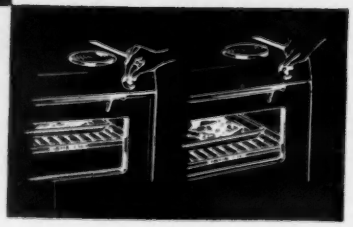

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On top or in the oven . . . Fastest-ever heating in an electric cooker!

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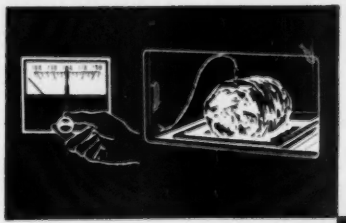

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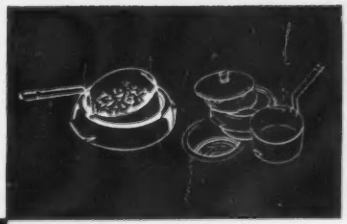
Another brilliant innovation. Just dial your preference for any type of meat (rare, medium or well done) . . . insert the electric meat thermometer probe . . . and a buzzer signals when the roast is done to perfection.



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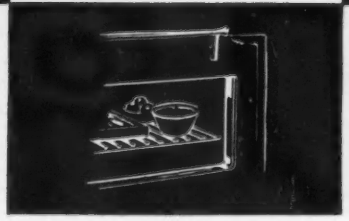

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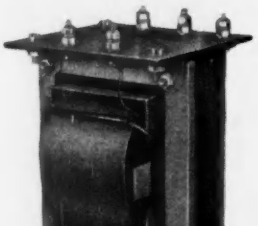

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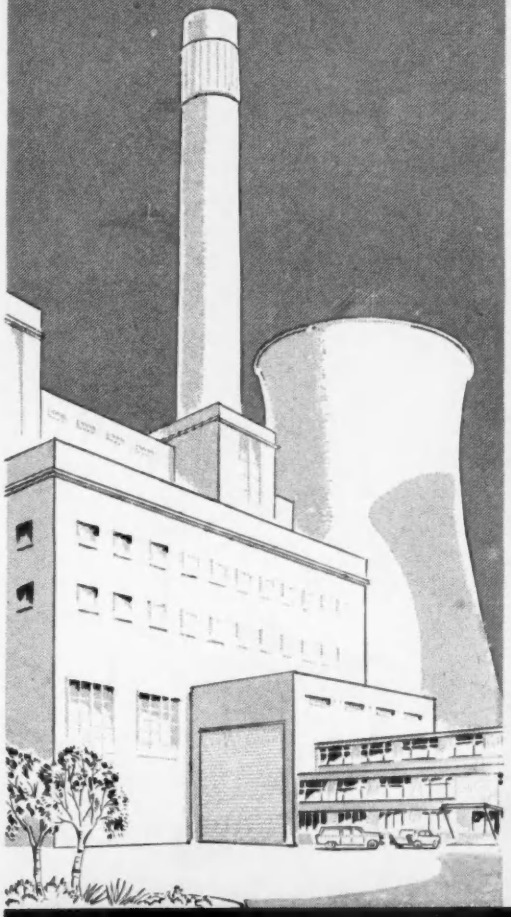
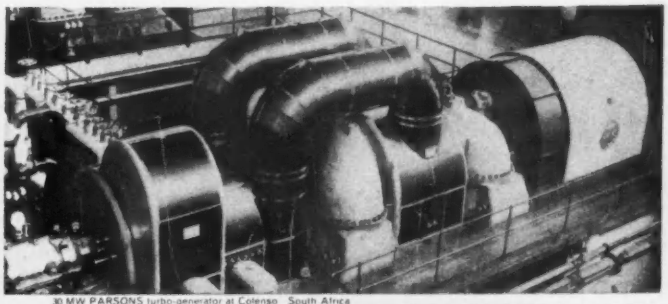
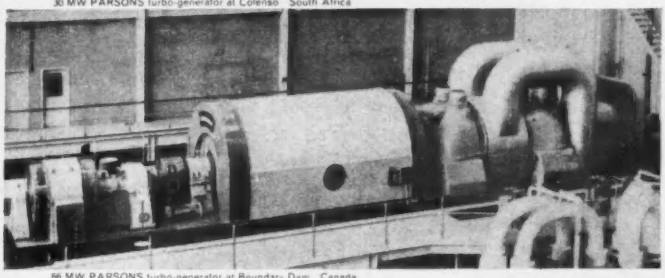
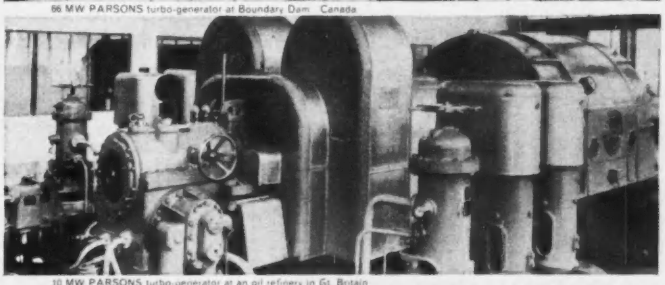




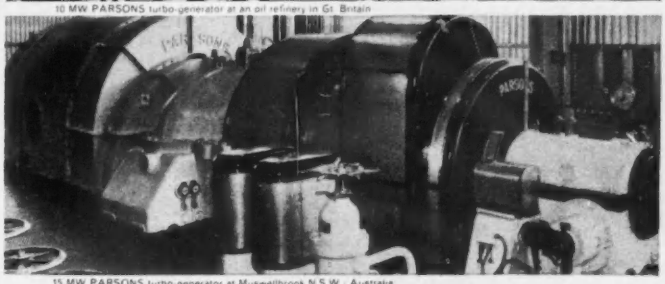
30 MW PARSONS turbo-generator at Colenso South Africa



66 MW PARSONS turbo-generator at Boundary Dam Canada



10 MW PARSONS turbo-generator at an oil refinery in Gt. Britain



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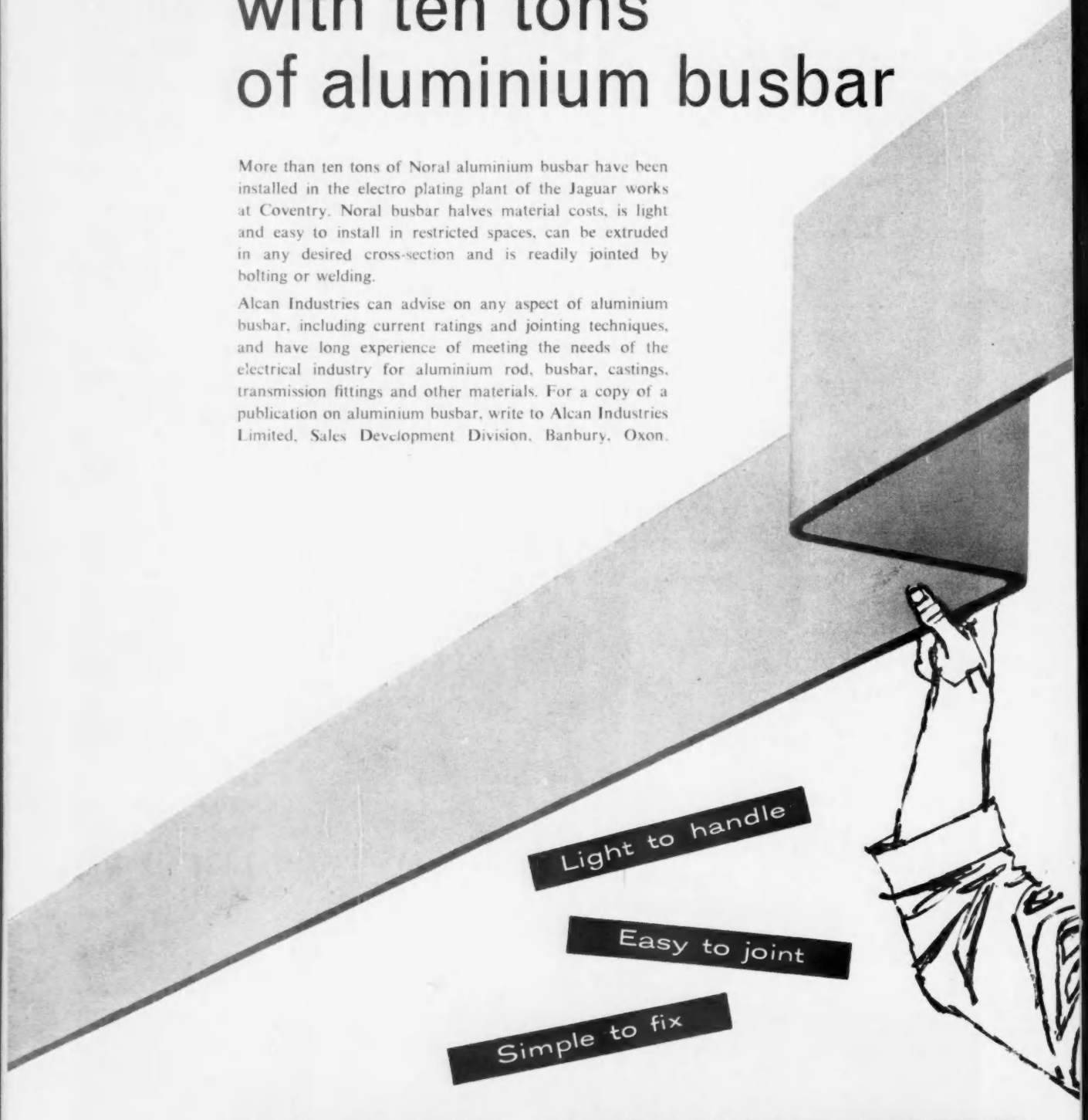

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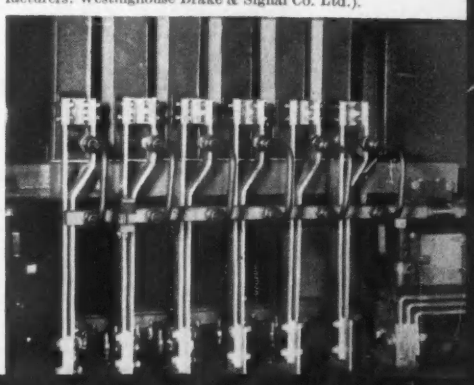

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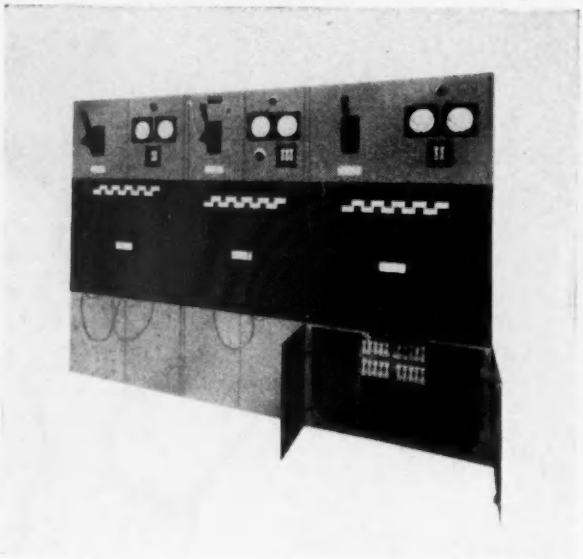

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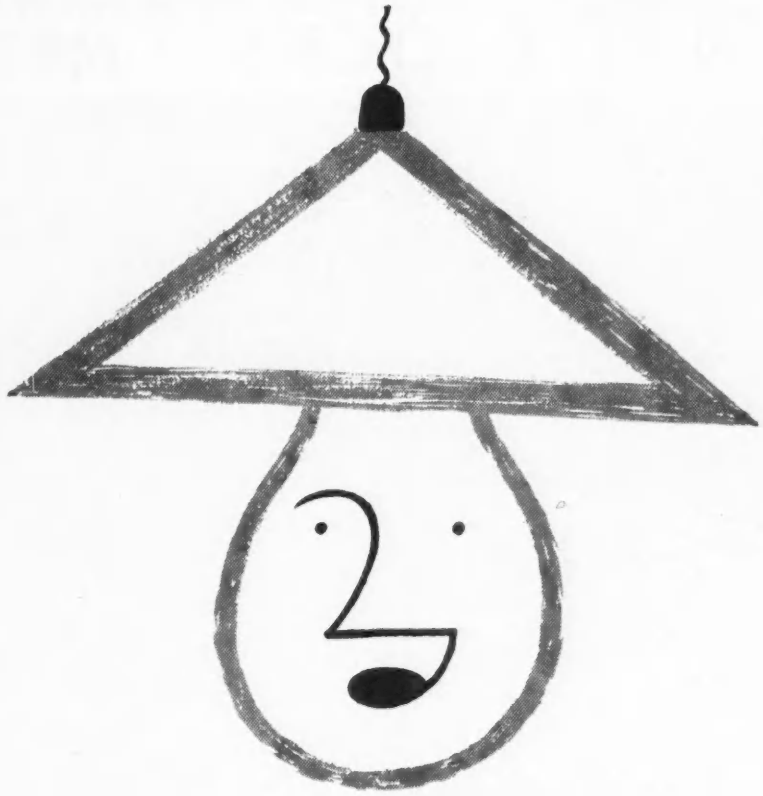

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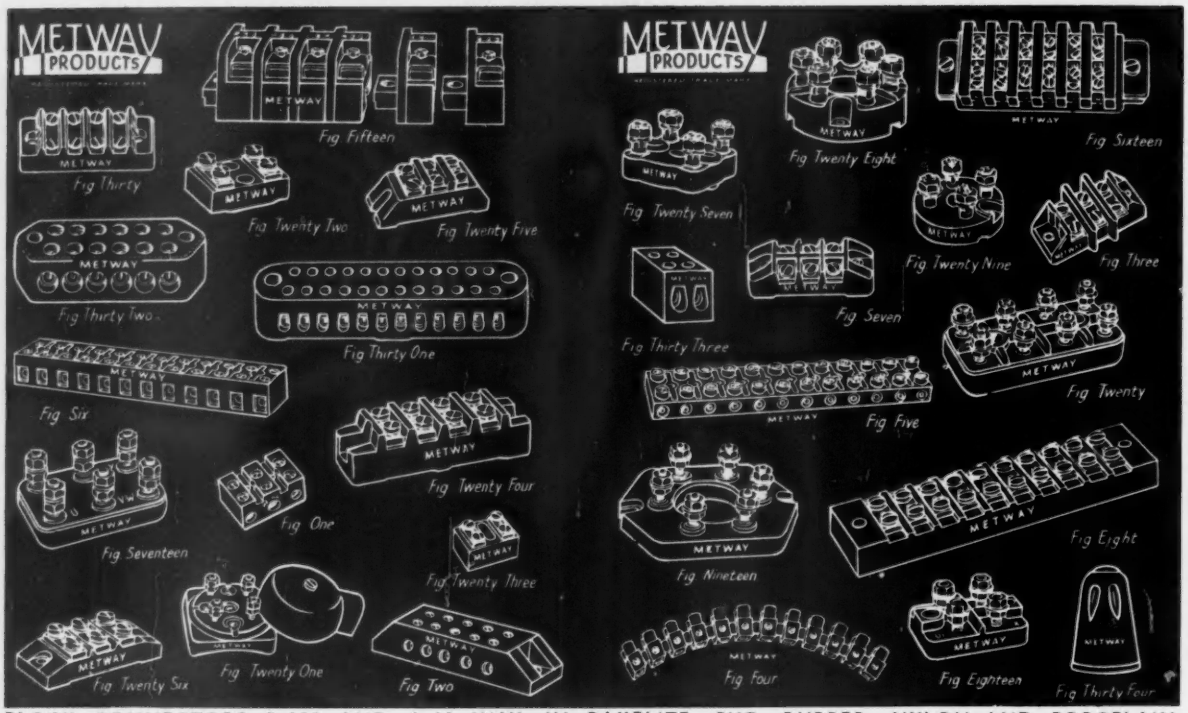

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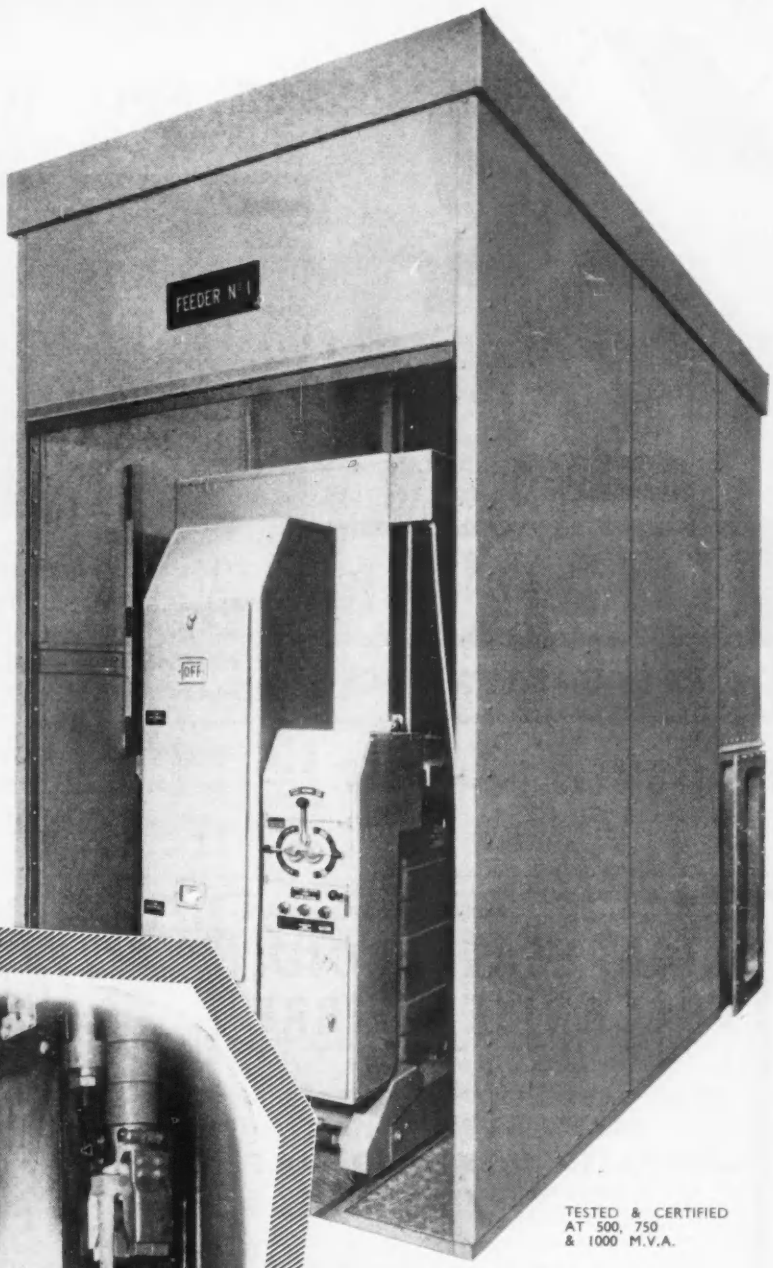

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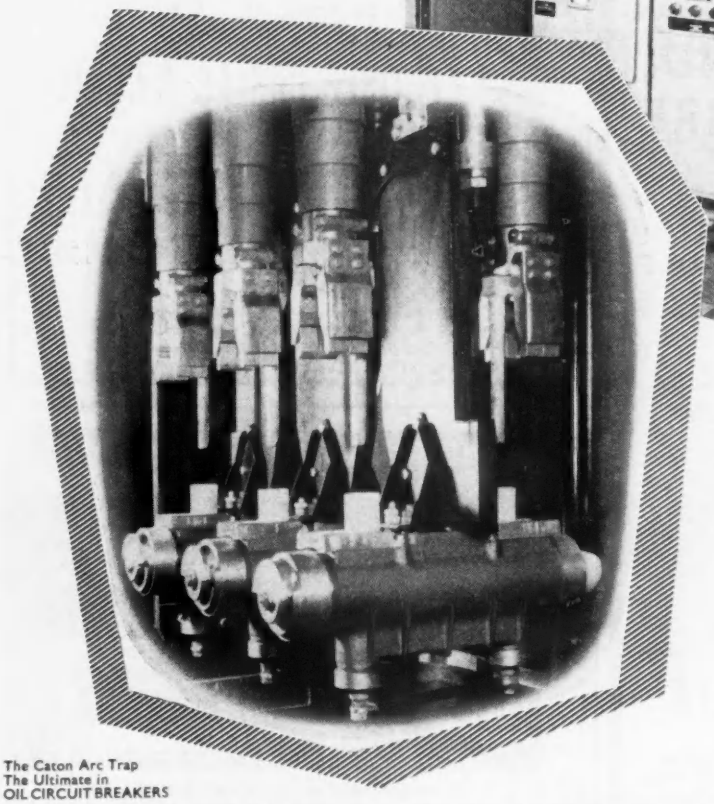

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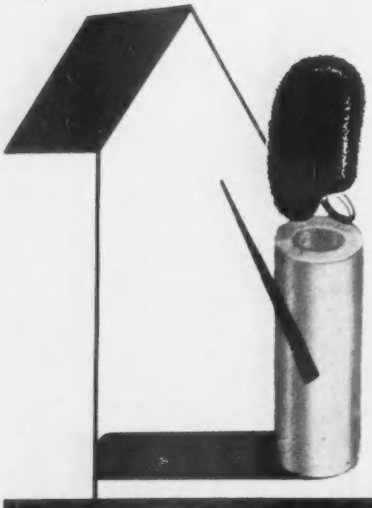

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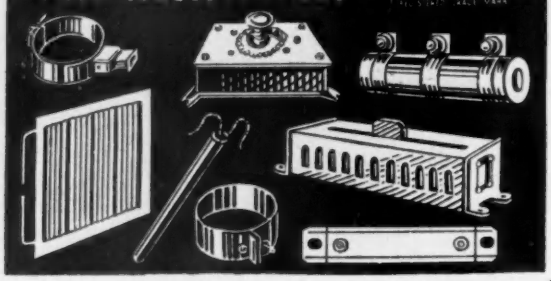

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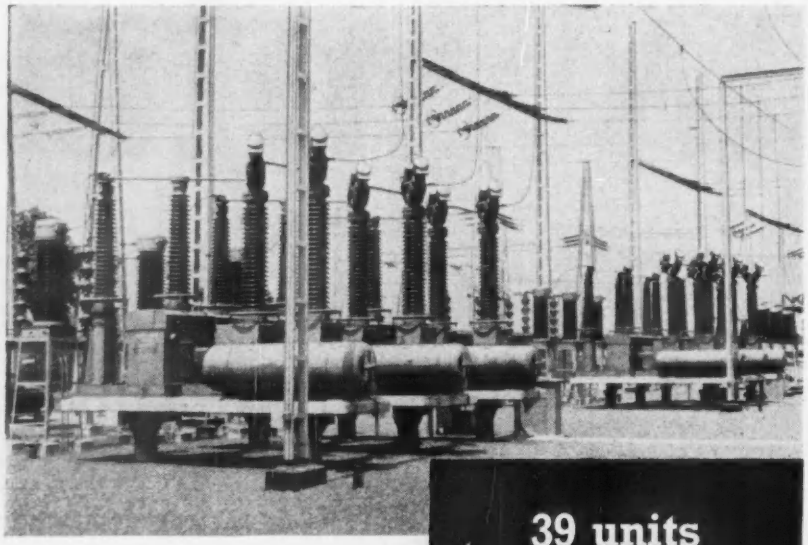

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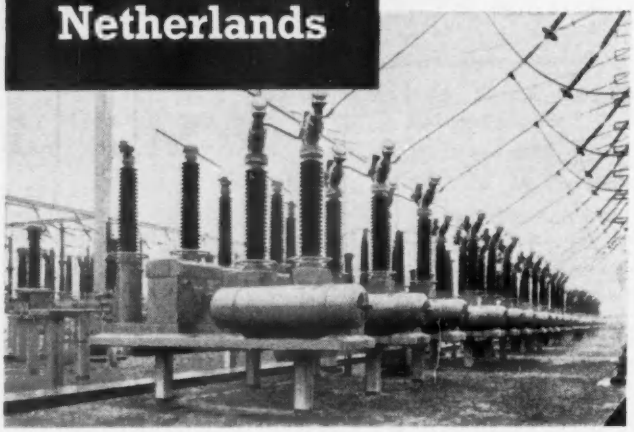

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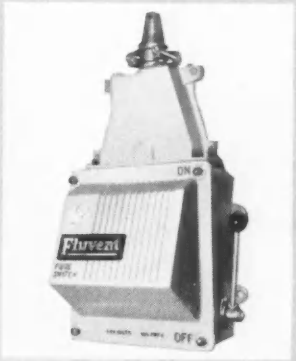

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